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POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

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"IT'S TOASTED"
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Engineers Tell Why

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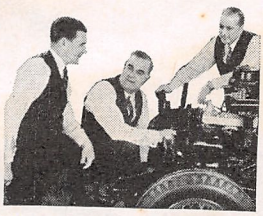
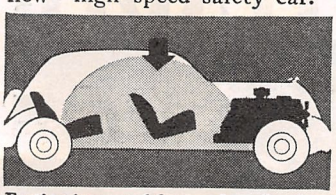


THE MEN who answered America's traffic problem... Chief Engineer Fred Zeder (center) and his colleagues, Carl Breer and O. R. Skelton ...builders of the first High-Speed Safety Car!

Today's congested highways demand this New Kind of Car

ALL DRIVERS hit it up faster than they used to. And there are almost twice as many of them on the road today as there were 10 years ago.

That gave Plymouth engineers their cue. America needed a different kind of automobile than had yet been built . . . a new "high-speed safety car."



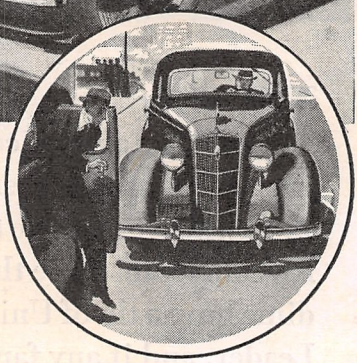
Engine is moved forward, as first introduced by famous "Airflow" cars.

So they started with the engine of the new Plymouth. They gave it greater power . . . for faster get-away and instantaneous response.

Yet, by improving the cooling system and the ignition timing, they actually *cut gas and oil consumption 12% to 20%.*

When you drive this car, everything will have a different "feel." The clutch works easier. Syncro-Silent Transmission simplifies gear shifting.

But probably the biggest change you'll notice will be in the ride. Bouncing and jouncing have been overcome by the new



Today, Plymouth is the only low-priced car with Hydraulic Brakes!

Plymouth's "Floating Ride!"

New weight distribution . . . new Mola Steel front springs and a sway eliminator . . . make you *glide* over the rough spots.

Any Dodge, De Soto or Chrysler dealer will gladly demonstrate the new Plymouth.

PLYMOUTH NOW ONLY **$565** AND UP F.O.B. FACTORY, DETROIT *World's Safest low-priced Car*

PAT O'BRIEN

Ex-football star. Made Hollywood debut in 1929. Now featured in "Devil Dogs of the Air," a Warner Bros.' picture. A Union Leader smoker since 1930.

"Believe me here's the best thing a dime is good for"

WHO says the best things always cost most? That rule doesn't work when it comes to tobacco. Because one thin dime buys a tin of Union Leader, and if any fancy mixture can top this *old*, mellow Kentucky Burley for aroma, flavor, and downright pipe-pleasure, I've never found it, and I've smoked some pretty snooty brands! (Great for cigarettes, too.)

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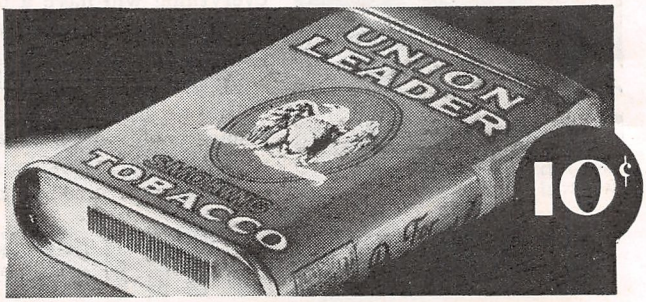

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Popular Mechanics Magazine

H. H. WINDSOR, Founder H. H. WINDSOR, Jr., Editor and Publisher

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How about Exploring America?

IN certain favored places in America, nature outdid herself in producing spectacular effects, some of which rank among the scenic wonders of the world. These locations, each with its own unique features, have been set aside as national parks. Today these parks, comprising more than 8,500,000 acres, have become the playground of a nation. Why not let nature entertain you next summer by planning a vacation in one of these wonderlands? Costs are surprisingly low. An article in the April issue describes the various parks and eight pages of pictures in color depict some of the wonders awaiting you.

Next Month

WHAT is your favorite sport? If it's baseball, Max Carey, former big league manager, has an article next month on training rookies. If it's fishing, Bob Becker has a story filled with tackle tips. Or if it's bowling, Mort Lindsey, trick bowler, gives you the low-down on rolling strikes.

Boss of the Big Cats

IF you have seen a man in a cage working a score of lions and tigers, you may have reflected that, after all, the animals are trained to their parts. But who trained them? This same man spent tedious weeks with each member of his troupe. And there was more excitement in the rehearsals than in the finished performance you witnessed. An article next month takes you behind the scenes with a trainer who works a "fighting act." The story will revise a few of your beliefs about the big cats.

News Reel of the Air

YOUR radio brings you events today from distant corners of the earth as they transpire—a royal wedding in England, an aviator soaring into the stratosphere, the voice of a polar explorer. You hear the news from remote places as it occurs because science has harnessed together the short and the long waves. An article next month explains how it was done.

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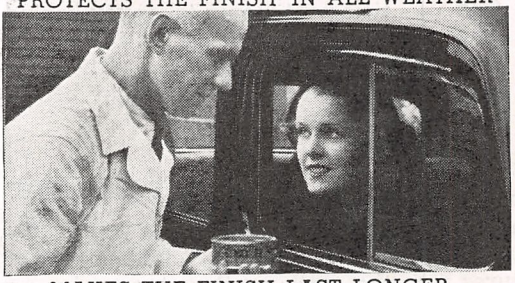

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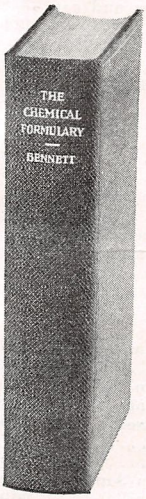

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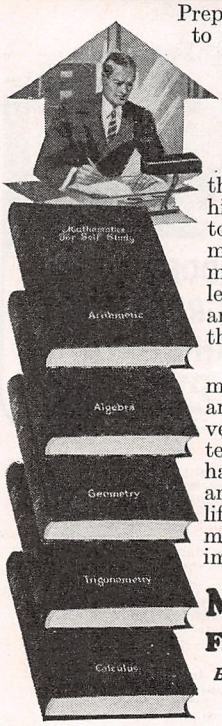

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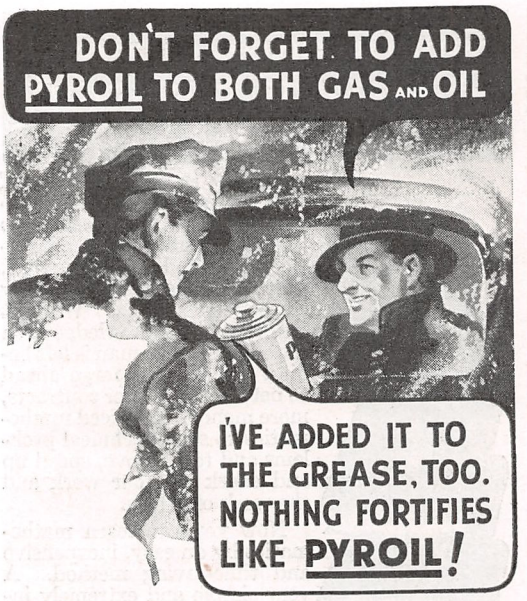

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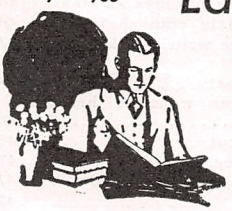

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2. Use only pencil or pen.
3. No drawings will be returned.
4. Write your name, address, age and occupation on back of drawing.
5. All drawings must be received in Minneapolis by Feb. 25th, 1935. Prizes will be awarded for drawings best in proportion and neatness by Federal Schools Faculty.

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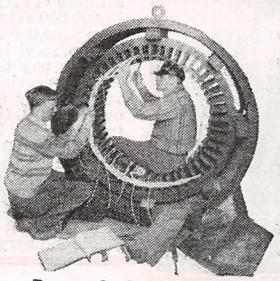

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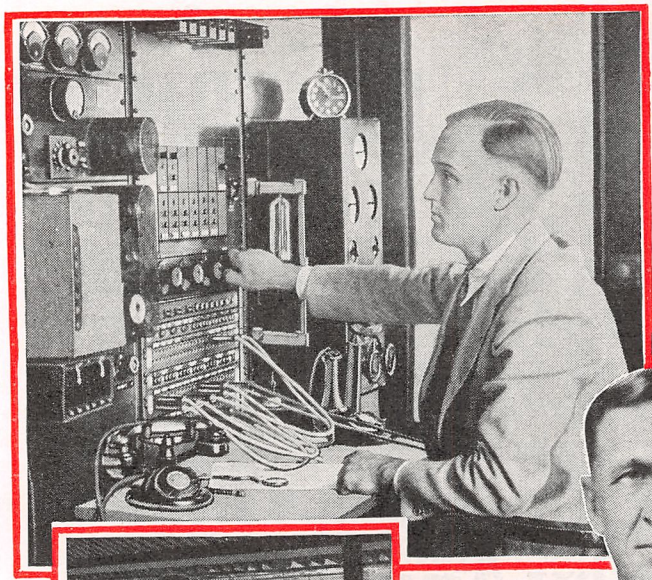

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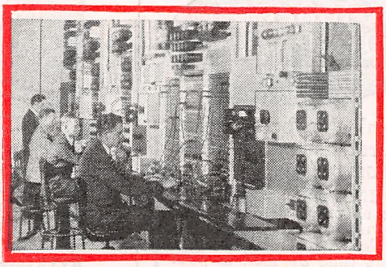

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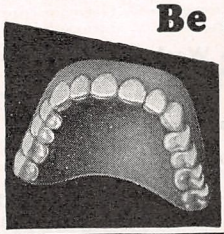

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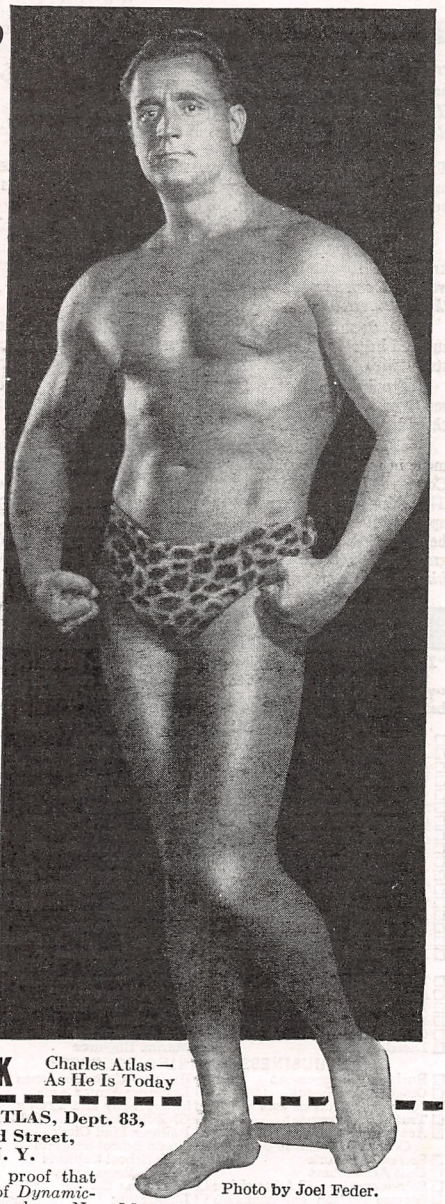

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Holder of the Title:
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Won in open competition in the only National and International contests held during the past 15 years.

I HAVE proved to thousands that my system of building powerful, big-muscled men begins to show real results *in only 7 days*—and I can prove it to *you*.

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New York, N. Y.

CHARLES ATLAS, Dept. 83,
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New York, N. Y.

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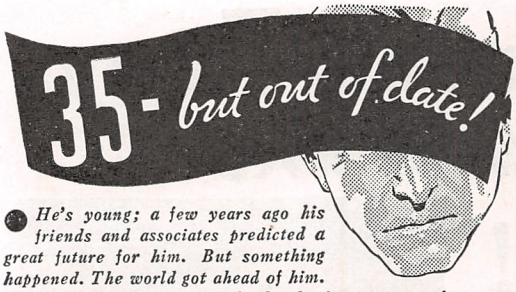

He's young; a few years ago his friends and associates predicted a great future for him. But something happened. The world got ahead of him. He didn't realize it until the business procession was almost out of sight. He is not alone in his predicament.

THINGS are happening today, men. Faster than they ever happened before. Old standards are passing. Success has a new order of requirements.

Yesterday a man was merely required to do his job well.

Today he must do that same job well — but he must also know the fundamentals of all other jobs associated with his work. *Specialization relates to business — not to the jobs in that business.*

What does this mean to you? Just this: The men who succeed hereafter are going to be exclusively those who combine study with their labors. They must capitalize their spare time.

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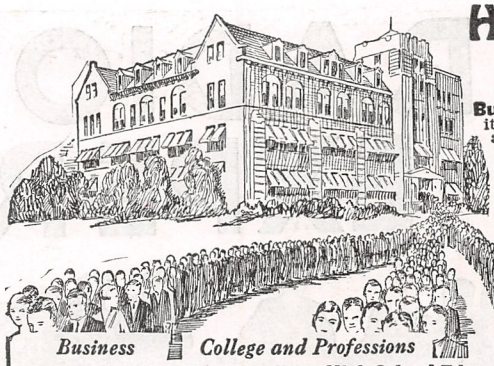

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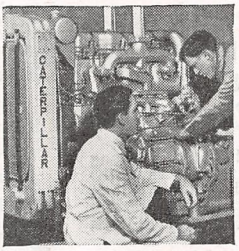

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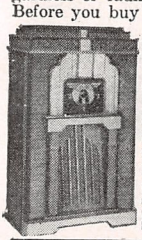

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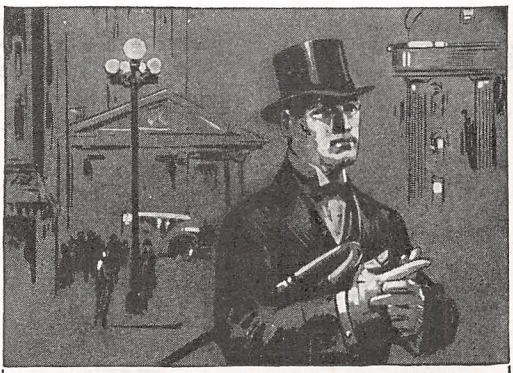

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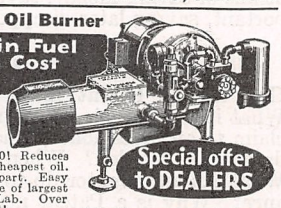

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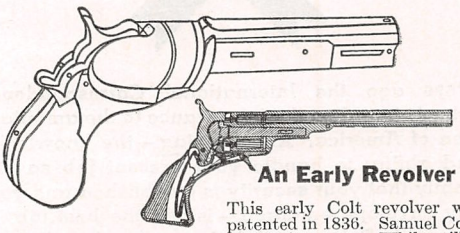
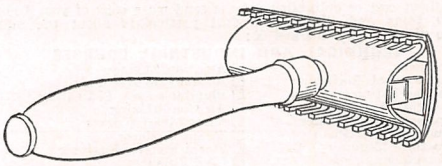


An Early Revolver

This early Colt revolver was patented in 1836. Samuel Colt, its originator, was known as the boy inventor. While still a lad he ran away to sea and whittled the first model of a repeating fire-arm out of wood during his leisure moments on shipboard. Colt was persevering. Three years later, in 1839, he had made improvements to produce the second revolver shown here. It was used in the Mexican War. By 1852, Colt had the largest fire-arms factory in the world. Colt died a very wealthy man.



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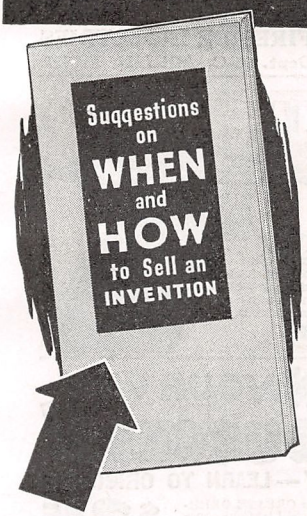

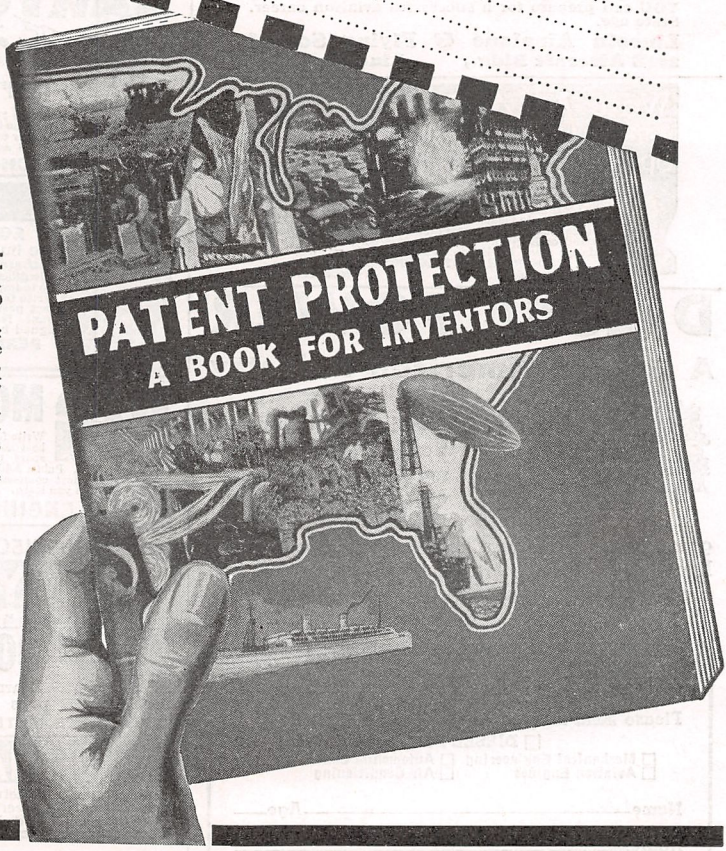

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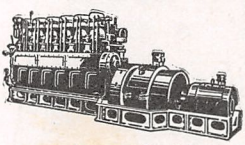

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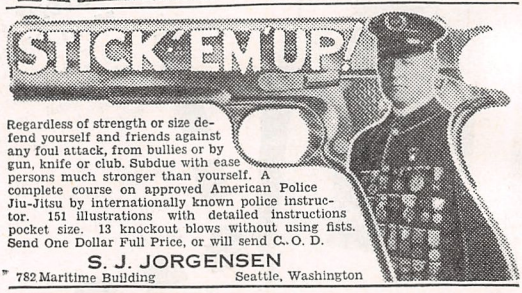

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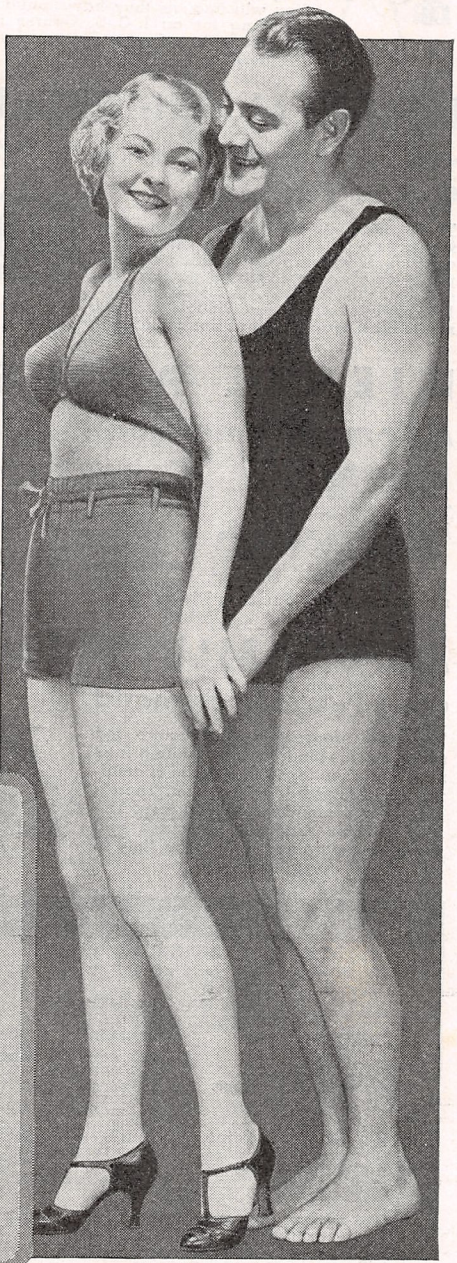

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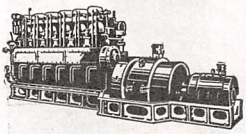

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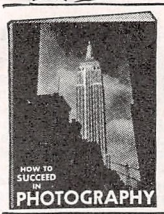

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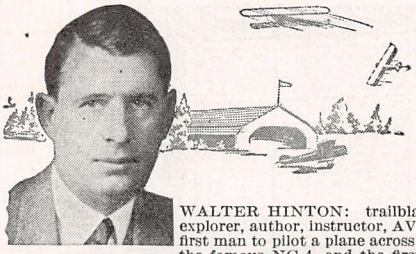

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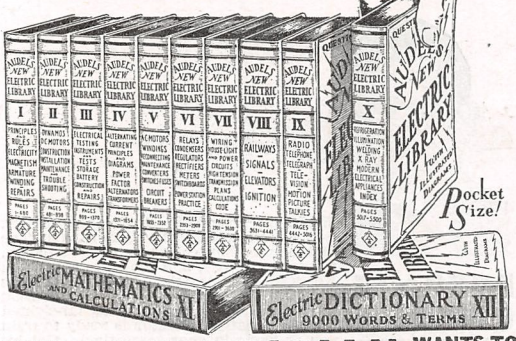

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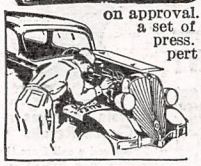

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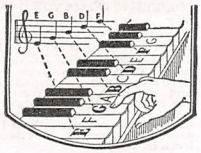

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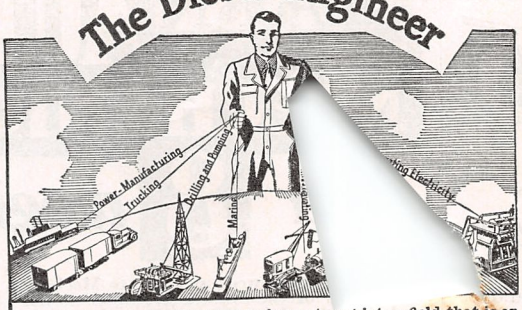

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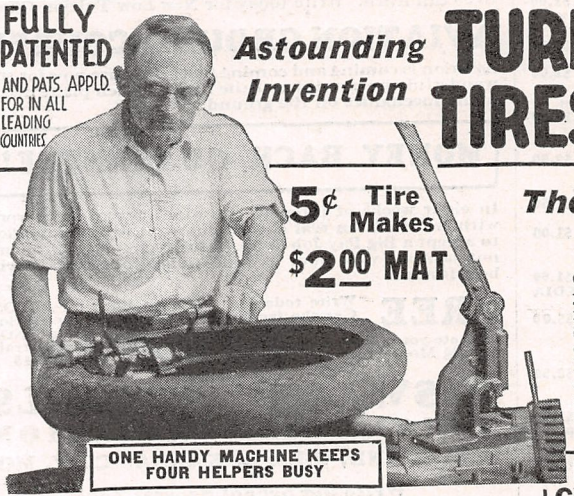

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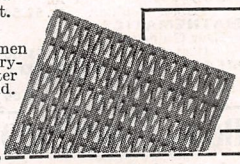

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"WHEN You have tried everything else, let us show you how to make a living." Write Federal Pure Food Company, A-2946 Lake Street, Chicago.

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NEW, Patented, no selling, send name. Springfield Products Co., Dept. 8, Springfield, Ohio.

$2.00 HOURLY With new, scientific cream that mends all cloth easily, quickly, invisibly, without needle and thread. Stands laundering. Free sample. Sew-No-More Co., Dept. G-744, Cincinnati, O.

TWO In one combination cigarette lighter and mechanical pencil. Sample 75c. Havalite Products Co., Rochester, N. Y.

NEW Cleaner! Washes clothes quickly. Cleans everything. Premium deals. Free sample. Bestco, 5007 Irving Park, Chicago.

DOUBLE-EYED Self-threading needle packages, size 3/9. Blind people thread them. Invaluable for failing sight, necessary for good sight. Sample, particulars 10c. Agents wanted. Wm. Oglesby, Vandalia, Ill.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 21A.

900,000 ARTICLES Wholesale. Directory 1,500 jobbers $1.00. 300—25c. Arts, B-1611-M, Denver.

QUALITY Flavors, attractive 4-bottle deal; two 4-oz., two 8-oz. Costs you 31½c, district manager's price. Sensational $1 seller. Favorite, 2100 Kennedy Northeast, Minneapolis, Minn.

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100% PROFIT In the mystery cigar lighter. No flint or friction. What makes it light? No wind can blow it out. Retails 25c. Sample and sales plan 25c. New Method Company, Desk PM-3, New Method Bldg., Bradford, Pa.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Ralco," 1084 Washington, Boston, Mass.

MAKE Products yourself. Formula catalog free. Kemico. 45, Parkridge, Ill.

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PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

100 PROFITABLE Mail order and local business plans. A. Pruitt, Elburn, Ill.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

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"HOW To Secure Agents," a specially prepared booklet, tells of one of the most inexpensive methods in which to secure good live producing agents. It is free; write for your copy today! F. W. Johnson, Mgr., Classified Advertising, Popular Mechanics Magazine, 200 E. Ontario St., Chicago, Ill.

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PORTRAIT Agents throughout the world. Lowest prices, portraits, frames. Catalog free. Picture Man Friedman, 528 Cornelia, Dept. 9, Chicago, Ill.

A BUSINESS Of your own—Making sparkling glass door plates, desk plates, numbers, signs, checkerboards, mirrors. Illustrated book free. Palmer Signs, 512. Wooster, O.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, extracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. H, Decatur, Ill.

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MAKE Extra money! Write for our special offer and catalog of household deals, cosmetics, extracts, etc. Make big money selling your friends and neighbors. Clyde Collins Chemical Co., Dept. 15 B-1, Memphis, Tenn.

OPPORTUNITIES Galore—Write for particulars. Over 400 money making ideas, plans, etc. A. Wolfe, 2085 Valentine, New York City.

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SELL Our attractive cigarette ash retainer. Latest winner. Big sales. Agents make big money. 40% discount on orders. Sample $1.00. Sales Manager, 21 Belvidere South, Sherbrooke, Que., Canada.

AMAZING Zipper pinless clothesline. Instant demonstration. Sure sale every home. Free guarantee sales plan. Dunn Bros., Hempstead, N. Y.

NECKTIES, Pens, pearls, pencils, combs, razor blades, etc. All big sellers. Heil Premium Co., Dept. M, Gaylord, Minn.

25c PER Thousand. Tin foil window sign letters. Make them yourself. Dollar bill brings complete details of press, cutter, printer, formulas, sketches, plans, blue prints, trade secrets, etc. Make your own equipment. Make any size, style, color or design. Information worth fortune. Atlas Sign Works, 7941 Halsted, Chicago.

NEW Mechanical wallpaper cleaner. Revolution invention. Banishes cleaning drudgery. Homes, offices buy instantly. Hustlers coining money. Outfit free. Kristee Mfg. Box 1433, Akron, Ohio.

CACTUS Candy, a goldmine for agents. Splendid sales. Unusual confection. Send $.25 for sample. Norust Sales, 390 Grand Ave., Rochester, N. Y.

COSTS 1c—Sells 25c. Make non-explosive cleaner from Benzyne Crystals. 1c gallon. Western Reserve Laboratories, 6615 Denison Ave., Cleveland, Ohio.

BE Independent. Own your business; experience unnecessary, selling $10,000 accidental death, $50 accident; $25 sick weekly benefits—$10.00 yearly. Other amounts proportionate. Guaranteed steady renewal income. $250,000 deposited insurance department. Universal Policy, 716-A Lefcourt Bldg., Newark, N. J.

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MEXICAN Feather pictures. Great profit. Send 25c (stamps) for $1.00 worth and details. Mexican Art, Apartado 1593, Mexico City.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, BD-4702 No. Racine, Chicago.

WANTED: Territory manager. Distribute amazing new teeth whitener. Address: Peri-Wyte Co., 38B - 28th Ave., Venice, Calif.

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DISTRIBUTORS: Represent manufacturer. Sell Latex—self sealing bandage that breathes. Great demonstrator. Lowest prices. 400% profit. Good repeater. Exclusive territory. Neway, 24-H South Clinton, Chicago.

1000 BUSINESS Cards cost $1.17. Sell $1.75. 3214 Huron, Chicago.

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SALESMEN, Representing national manufacturer selling tickets, checks to hotels, theaters, restaurants, clubs, busses. Liberal commission. Elliott Ticket Co., 12 Vestry Street, New York.

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SALESMEN: Acquainted with garages, filling stations, to handle local business. Write Colgra, 2629 N. Third St., Milwaukee, Wisconsin.

WANTED: County salesman with car, to demonstrate and service for large Ohio manufacturer. First-class job. 244 Fyr-Fyter Co., Dayton, O.

BIG Profits in advance—Exceptional opportunity for ambitious men to introduce our personalized belt and buckle. Over 550 emblems and designs, raised letters and colors. Actual samples supplied. Write for free sales plan. Hofmann "Hook-Fast" Specialties, Box 1425, Providence, R. I.

NEW, Special featured necessities for filling stations, garages, and all business places. Products they have to buy. Experience unnecessary. Reserved territory, great repeat orders, 100% profit. Write Harper Mfg. Co., S. Main, Fairfield, Iowa.

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DON'T Be a job hunter—Start your own business on our capital. No hard times; no lay-offs, always your own boss. Hundreds average $3,000 to $5,000 annual sales year after year. We supply, stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful opportunity to own pleasant, dignified, profitable business backed by world wide industry. Write Rawleigh, Dept. C-U-PPM, Freeport, Ill.

YEAR'S Income in 3 months! New federal, state and code laws create immense demand for simplified record system every businessman must have to protect himself against fines and penalties. Millions users must buy again now. Our men selling 5 to 25 daily our officially approved, copyrighted Liberty Tax Record. $3.50 cash profit every sale. Repeat commissions without callbacks. Live leads furnished. Big season now. Choice territories going fast. Commonwealth Publishing Company, 508 So. Dearborn, Chicago.

START A business of your own! Become a subscription representative for "Popular Mechanics." No capital required. Liberal commissions. Monthly bonus. Write for details. V. D. Angerman, Circulation Manager, 200 East Ontario Street, Room 235, Chicago.

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BRAND New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4373 Ravenswood, Chicago.

NEW Specialty—Sells every business and professional man. Four $15 sales daily pay $280 weekly. Foyer cleared $4920 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

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STICK-ON Window sign letters. 500% profit. Free samples. Metallic Co., 438-A N. Clark, Chicago.

SALESMEN Wanted—To sell brand new, patented, low-priced, non-competitive article, just being marketed. Salesmen sample 10c. Ideal Company, Racine, Wis.

SALESMEN: Sell complete line gummed labels, calendars, memo books, and business stationery. Special features. Free deals. Write quick. Big comm. daily. Attractive sales portfolio free. Willens, Dept. AP, 2132 Gladys, Chicago.

NEW Marvelous electric light bulb gives strong concentrated white light. Consumes 36% less current. Stores, factories, institutions buy quantities on sight. Big profits. Exclusive opportunity for right party. Masterlite Corp., 110 East 23rd, New York.

LOW Cost portable water softener; sensational demonstrator; big profit. Softete, Kansas City, Kans.

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PENNY Each. Non-tarnishable window sign letters. Free samples. Atlas Sign Works, 7941 Halsted, Chicago.

BIG Money in tire patches. Sell new auto tire patch to service stations, garages, etc. Tiger-Grip patches guaranteed 10,000 miles. $75 weekly for salesmen or distributors. Protected territory. Write Economy Rubber Co., 739 Burkhardt, Dayton, Ohio.

SALES Demonstrators. U-Kan-Plate with pure silver. 1 oz. polish 20c, 8 oz. $1. Justice, 904 Walnut, Philadelphia.

HERSHEYS, Baby Ruth, Oh Henry, candy deals—1c - 5c. Display and punch deals. More profit for dealers—unheard of candy profits for you. Casterline, 1918 Sunnyside, Chicago.

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RADIOS—World's cheapest. 55% commission. Catalog free. J-20th Century Co., Kansas City, Mo.

MAKE More money taking orders. Shirts, ties, underwear, dresses, hosiery, raincoats, coveralls, pants, uniforms. Outfit free! Nimrod Company, Department 65, 4922-28 Lincoln Avenue, Chicago.

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TRADE Stimulator (chinaware) for retail merchants. $5.00 to $50.00 commission each sale. References. Lancaster, BB-128 North Wells, Chicago.

FREE Booklet describes 87 plans for making $20-$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

HELP WANTED

LOCAL Men wanted to show actual samples for big tailoring company. Make up to $10.00 in a day. Wear suits free of extra charge. Big, valuable equipment, many actual samples sent free if you write quick. Send no money. Great Lakes Tailoring Co., Dept. Q-1417, 500 Throop, Chicago.

BIG Money growing mushrooms. Cellar, idle places. Supplies furnished. We buy. Free book. Mushroom Growers, DW-433, N. Clark, Chicago.

GO Into wholesale business without investment. Call on stores with biggest line self-selling counter displays: Aspirin, razor blades, handkerchiefs, breathlets, household cement, 79 different items. Up to 125% profit for you. Experience unnecessary. Write for catalog and plans. Procopax, Dept. 36-GD, 1956 S. Troy, Chicago.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 21A.

LOCAL Agents wanted to wear and demonstrate free suits to friends. No canvassing. Up to $12 in a day easy. Experience unnecessary. Valuable demonstrating equipment, actual samples free. Progress Tailoring, Dept. Q-217, 500 Throop, Chicago.

SELL Hard worsted suits $16.95. Make $5 profit. Extra pants at cost. Finest workmanship. Over 30 hand operations. $25,000 bond guarantees satisfaction. Customers repeat. Complete DeLuxe sample outfit free. Actual leads furnished. Bonus sample suit. Williams Bros., 832 Broadway, Dept. PM-3, New York City.

MARRIED Man with spare time to distribute free samples coffee, flavoring, food products and make customers. Must devote at least two hours daily and be satisfied with up to $3 in an hour. Permanent. Blair, Dept. 321-C, Lynchburg, Va.

REAL Jobs open—Auto mechanical field, aviation. Earn $35.00-$75.00 weekly. 8 weeks' training qualifies you. Write for big opportunity book and special low tuition now. McSweeny Schools, Dept. 10-A-15, Cleveland, Ohio, or Kansas City, Mo.

GROW Mushrooms all year round—a steady income indoors, in cellar, shed or stable. Exclusive new process. Bigger, better, quicker crops—more money for you! Book free. American Mushroom Industries, Dept. 128, Toronto, Ont.

MEN Wanted—For coffee routes paying up to $60 a week. I furnish everything you need. Albert Mills, 8954 Monmouth, Cincinnati, Ohio.

EXTRA Money growing mushrooms in cellars, outbuildings. Ready market. We assist you and give full instructions. Booklet free. Adanac Mushroom Company, Dept. 147, Toronto 8, Canada.

MAN Wanted—Old established manufacturer will finance responsible men with complete stock guaranteed food products, farm and household necessities. Very pleasant work. Excellent opportunity for good living and extra money to save every week. Pays better than most occupations. O. W. Jack sold $308, B. M. Anderson $330 in one week. No slack seasons or layoffs. Experience unnecessary. Write today for No-Investment Offer. McConnon & Company, Room 66CT, Winona, Minn.

AGENTS—Mosco corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Moss Company, 54 Searle Bldg., Rochester, N. Y.

EARN Quick cash raising mushrooms in cellar, shed, attic. We buy crops. Guaranteed materials furnished. Easy, odorless method. Book free. United, 3848-AO Lincoln Ave., Chicago.

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BIND Your own books, magazines, etc. Enjoy hobby, small cost. Do bookbinding for others, rebind for libraries, nice profit. We furnish all supplies and easy rules. Complete outfit $9.37. Write for details. Kelsey Binders Supplies, G-101, Meriden, Conn.

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BECOME An investigator. Free particulars. Write International Secret Service Institute, PM-35, Hoboken, N. J.

WORK For "Uncle Sam." Start $105-$175 month. Men-women, 18-50. Many spring examinations expected. List free. Qualify now. Franklin Institute, Dept. N3, Rochester, N. Y.

BECOME A successful investigator. Experience unnecessary. Work at home or travel. Write today for free publication and particulars. National System, 340-G Electric Building, Omaha, Nebr.

LEARN New trades in your spare time—Refrigeration, oil burners, air conditioning servicing. Herkimer Institute, 1819 Broadway, New York.

GET U. S. government job—start $105-$175 month. Men-women, age 18-53. Are you eligible for eligibility test? Get our free questionnaire—find out. No obligation whatever. Instruction Bureau, 101, St. Louis, Missouri.

U. S. GOVERNMENT Positions. $1700-$1900 and up a year. Let our expert (former government examiner) prepare you for a position in the railway mail service, rural carrier, post office, customs and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

BECOME A landscape architect. Easy to learn by mail. Wonderful opportunity for money-making. Earn while you learn. Write for free opportunity booklet and details. American Landscape School, 805 Plymouth Bldg., Des Moines, Iowa.

HOME Study courses leading to degrees: Arts and sciences, philosophy, education, law, letters, theology, psychology, engineering, chemistry, business and commerce. Many others. McKinley-Roosevelt University, Chicago.

LEARN Chiropody. Complete course by correspondence. Evans Foot Inst., Montgomery, Ala.

GET Into aviation. Air transport pilots get up to $7,000 per year; mechanics, $2,500. Learn at this government approved school. Write for complete information. State age. Lincoln Flying School, 2005 Aircraft Building, Lincoln, Nebr.

MEN Wanted—To learn Machinist trade Tool and Die making, Automatic screw machine. Get experience on actual work. Employment help. Start now. Days—evenings. Write for free book. Allied Screw Machine Co., 601 Lake St., Chicago.

RESORT Hotel positions. Instruction courses. Lee Institute, 22 Wesley, Somerville, Mass.

NEW Writers wanted. We train you to write for newspapers, magazines. Good writers well paid and in demand. No experience necessary. Write today. National Press, 3806 Beverly, Los Angeles, Calif.

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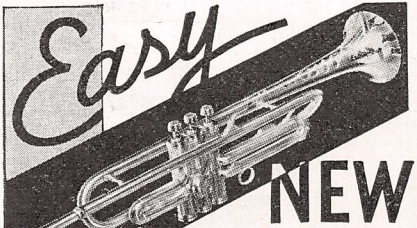

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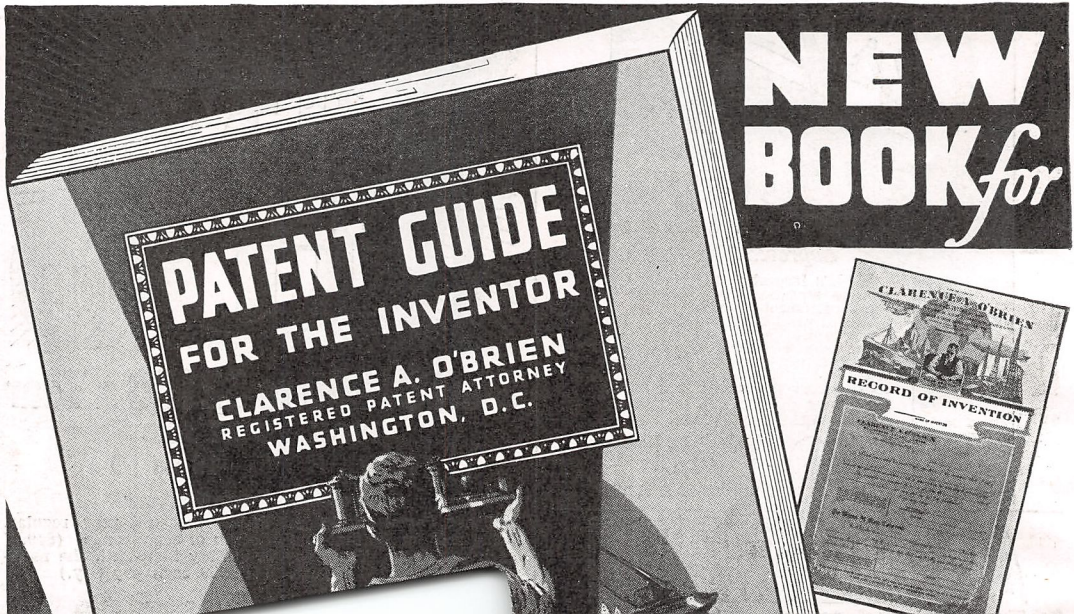
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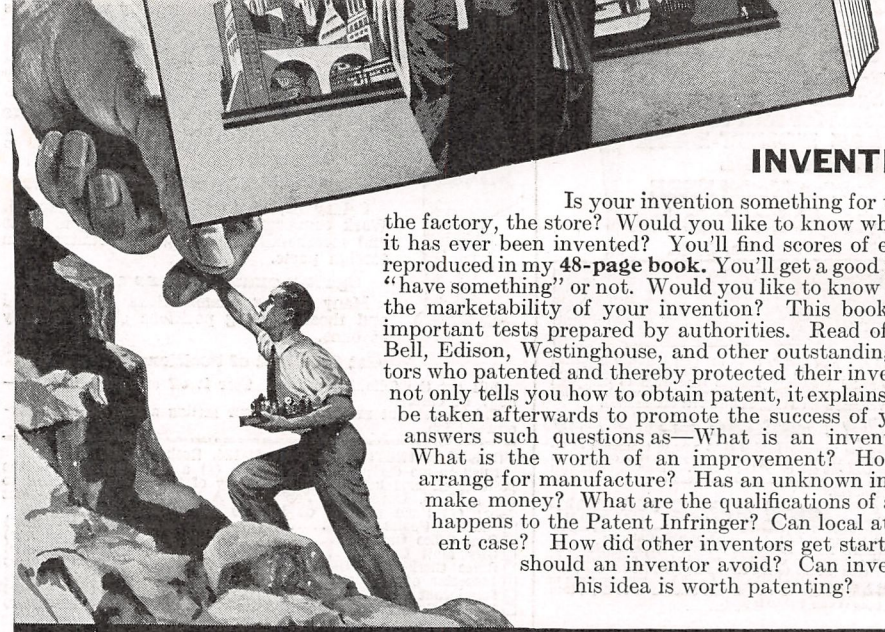

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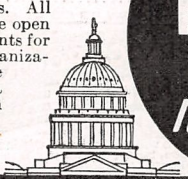

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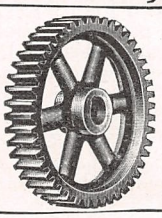

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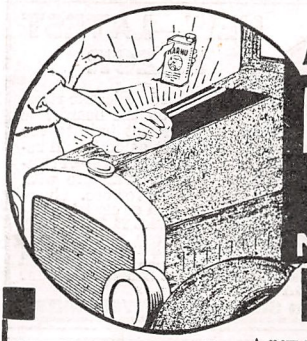

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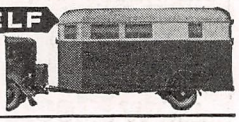

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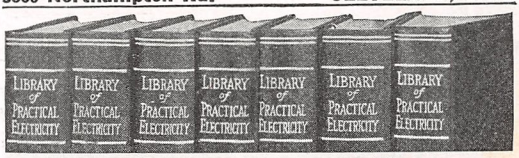

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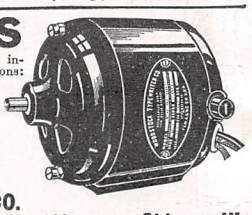

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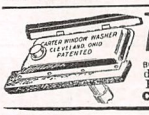

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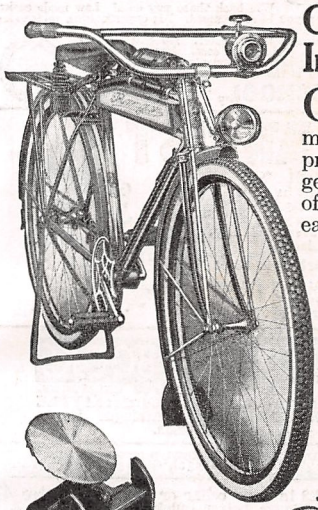

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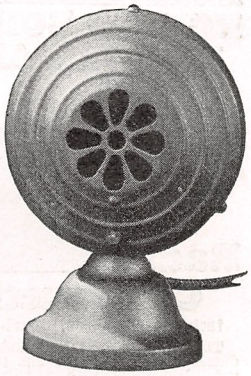

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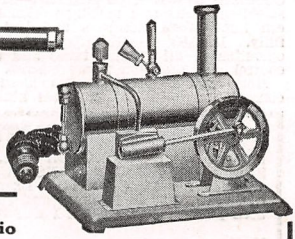

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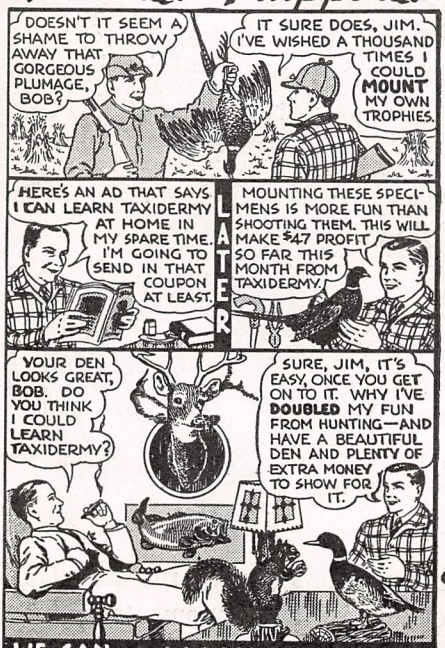

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If Johnny's father were alive, things would, of course, be different. But unfortunately he put off taking out life insurance; that is why Johnny's mother cannot give him her full time now.

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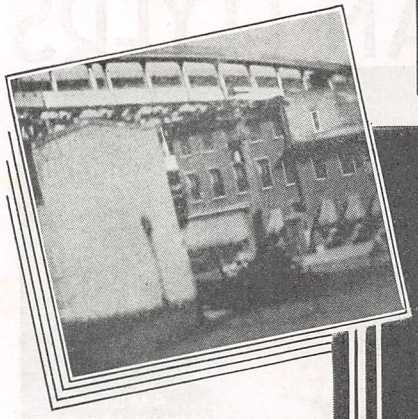
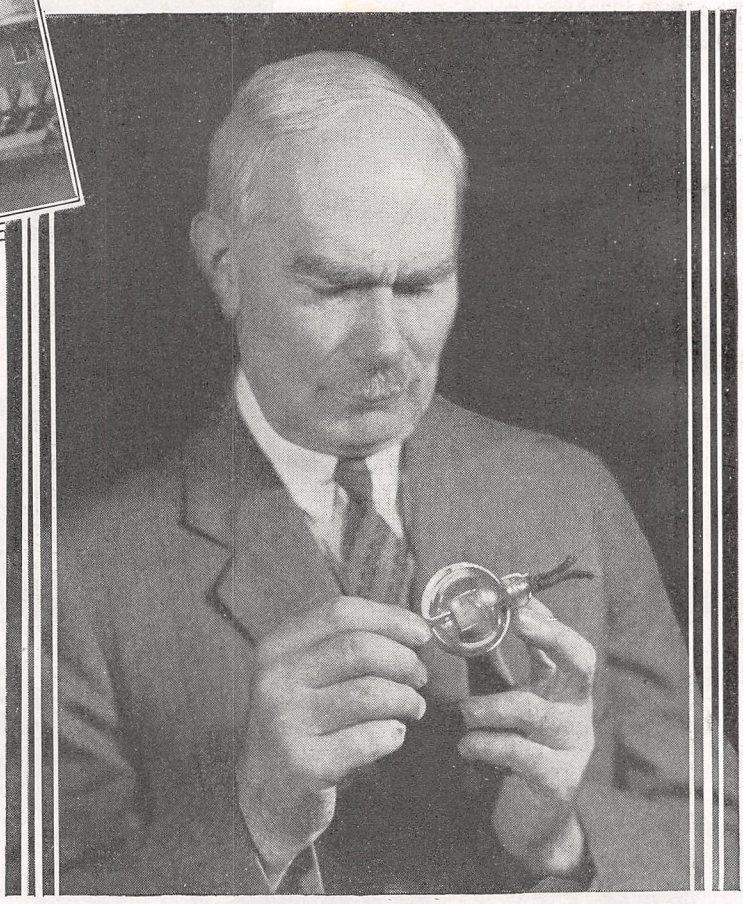
Safety Equipment Carried by Amelia Earhart Putnam When She Became the First Person to Make a Solo Flight from Honolulu to California; Note Balloon Used to Attract Attention

MIRACLES





Left, Television Image Reproduced on Cathode Ray Tube from Outdoor Pickup; Right, Author Holding 1908 Tube Used in Radiophone

By DR. LEE DE FOREST

TELEVISION programs are being broadcast today, many of them on regular schedules, from nineteen different stations from New York to Los Angeles.

A television motion picture has been successfully reproduced in an airplane cruising among the clouds.

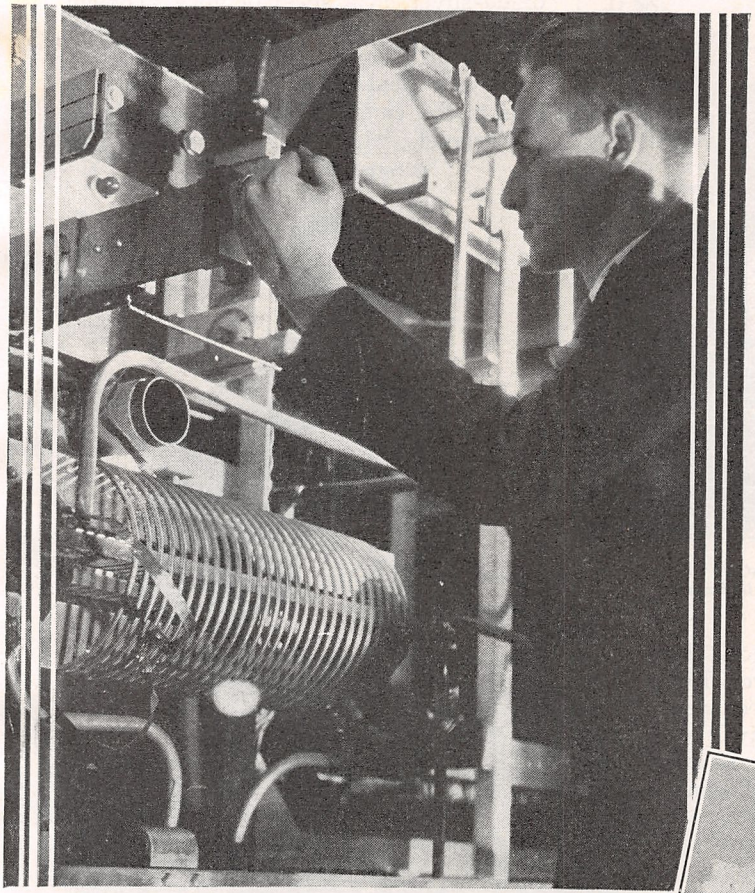
Long-wave television pictures put "on the air" in Los Angeles have been received at Oakland, 350 miles distant and at Houlton, Maine, 2,500 miles distant. Regularly programs of feature film plays and short subjects go out by short wave from scattered stations. How many thousands are receiving these programs, largely with home-made receivers, no one can say. Yet we stand today at the threshold of radio's next great advance—the wedding of television broadcasting to audio broadcasting. In several laboratories scientists are perfecting methods which soon will permit "pictures" in their various forms to be broadcast to the accompaniment of sound.

By the word "pictures," I mean groups assembled in broadcasting studios as well as nearly every kind of scene viewed by theater audiences today—staged events, such as boxing, wrestling, ice hockey, operas, motion pictures, the President in his fireside chat—anything, in brief, which can be illuminated adequately and brought within range of the television camera.

Television will hook in with the present machinery of broadcasting. It can start probably before the close of 1935, in two important cities, with 1,000 receivers reproducing pictures broadcast from each station. From such a beginning, it will roll like a snowball across the continent, with transmitters in all cities now supporting radio broadcast stations.

Unlike present radio broadcasting, tele-

in TELEVISION

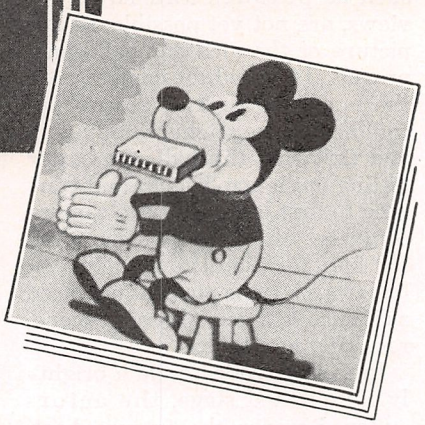


Left, Operator at Switch of WLW's 500,000-Watt Amplifier; Right, Television Image from Movie

vision will have a comparatively short range. To create the illusion of motion successfully, each image must consist of no fewer than 180 parallel, shaded lines, twenty-four pictures appearing each second. This necessitates a wide band of frequencies, ranging from fifty to 1,000,000 a second, which represents such a broad range of the radio spectrum that we cannot transmit them except at high frequencies, or below ten meters.

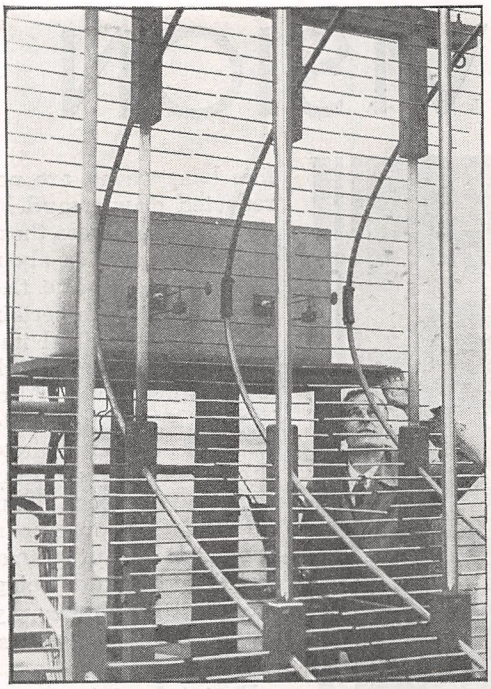
These are known as "quasi optical" waves, which travel only about as far as the eye can see, or in the neighborhood of fifty miles. These ultra-short waves, unlike long waves, are not reflected downward by the heaviside layers, those mysterious strata about fifty miles above the earth from which certain types of electrical impulses are turned back toward this planet. Also, it will be impracticable for wires to carry these short-wave programs from coast to coast. Thus we must depend upon numerous local programs, sound and picture being broadcast simultaneously on long and short waves, respectively.

First television programs will adapt the present experimental method of motion pictures. In the homes, the television receivers will be located near present



radio receivers, thus preserving the illusion of sound and picture emerging from a common source.

Eventually, television cameras will be pointed toward scenes in and out of doors. I have picked up outdoor scenes, including games of quoits and baseball. Wires



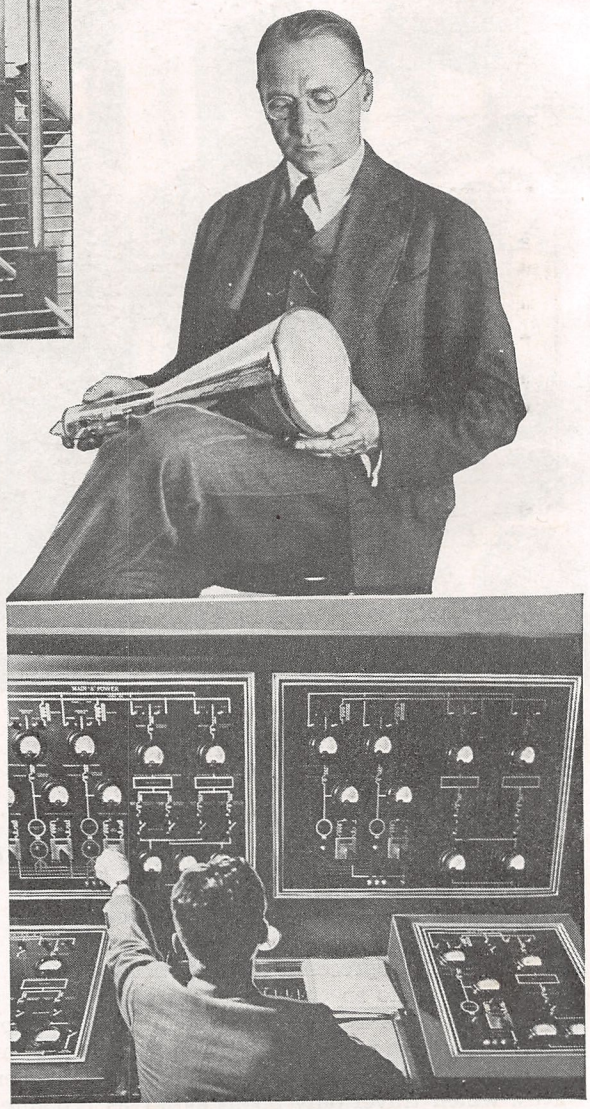
Marconi Micro-Wave Aerial System with Parabolic Reflectors; It Is Used in Experimental Work

carried the impulses from the camera to an indoor receiver. Reproduction of great spectacles, such as parades and naval reviews, are not yet possible, as our picture of the amateur ball game proved. I planted the camera near the home plate and found we could catch the pitcher winding up and throwing the ball, the batter hitting out a two-bagger and running to first base. But the camera could see clearly no further than 100 feet, for the distance between lines forming the picture increased as it encompassed a broader scene, resulting in a blur.

In early broadcasts on a brightly illuminated stage, the actors suffered under the intense heat, but now we have improved photo-electric cells for the pick-up apparatus. The scanning disc pick-up with a single photo-electric cell has been superseded by a multiple-cell plate known as V. K. Zworykin's iconoscope, and the electron picture of Philo T. Farnsworth.

The iconoscope is a vacuum tube containing an electron gun and a photosensitive surface consisting of millions of microscopically tiny droplets of caesium-oxide-silver on a sheet of mica. Though thicker than frost crystals on a window pane, each droplet not only is separated, but is also insulated from its neighbors. A lens in the camera focuses the image on the droplets, which in turn free electrons

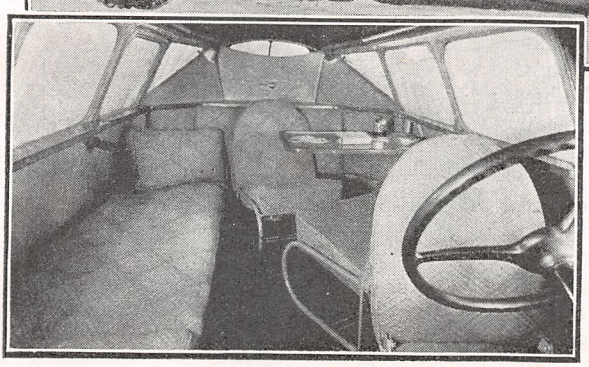
(Continued to page 130A)



Center, Dr. Zworykin with the Kinescope, "Heart" of Latest Television System; Bottom, Power Control Desk at NBC's Headquarters in Radio City

Rear-Engine 'Beetle' Car Is America's Latest

Closely Resembling a Beetle, William B. Stout's "Scarab," an Entirely New Automobile, Is Introduced to America; Top, Right, Note Absence of Fenders and Running Board as Passenger Steps to Floor of Car from Ground; Lightweight but Strong, the Car Will Be Produced in Limited Quantities This Year

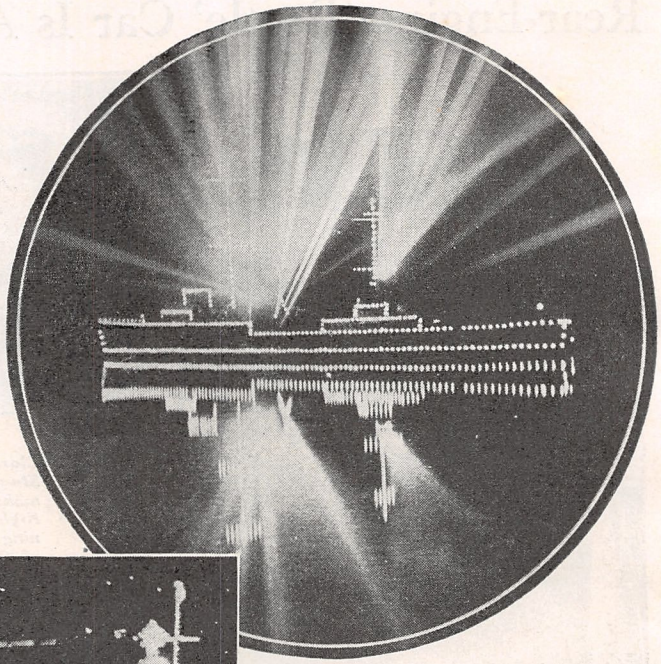


Top, Left, Movable Chairs Enable Passengers to Ride in Greater Comfort; Table Is for Reading, Eating, etc.; Center, Side View of Car, Which Has Its Engine at the Rear; Note That Windshield Is over Front Axle, Giving More Visibility; Controls Are Conventional; Unusual Riding Comfort Results from Spring Suspension Consisting of Airplane Landing Gear on All Four Wheels, Including Coil Springs with Large Oil Cylinders to Absorb Shocks

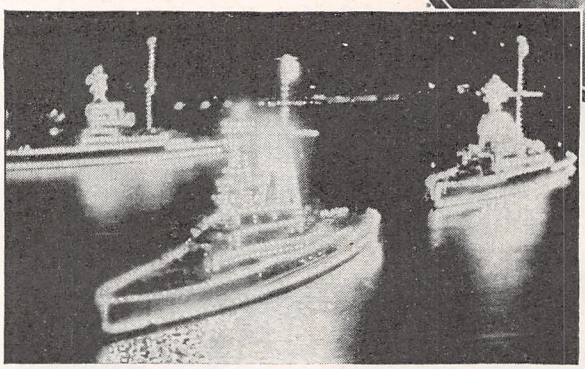
Bottom, Interior Which Has Five Inches More Headroom Than Conventional Car; Note Rear Seat Has Been Moved to Side and Extended for Sleeping, Making Day and Night Travel Easier

WARSHIPS DRESSED IN LIGHT FOR NIGHT SHOW

British battleships in English harbors celebrated the recent royal wedding of the Duke and Duchess of Kent by appearing in a blaze of lights and color the night following the ceremonies. The ships were decorated from bow to stern with thousands of electric lights while their powerful searchlights made an aurora over the fleet, forming a gorgeous spectacle for the spectators on shore.



British Battleships Ablaze with Lights in Celebration of a Royal Wedding

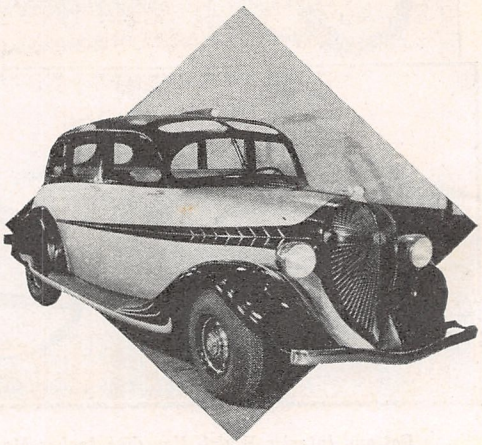


ONE FIVE-MILLIONTH OF AN INCH MEASURED ACCURATELY

By magnifying light waves one-hundredth of an inch wide so they appear as quarter-inch stripes, Chauncey G. Peters, chief of the bureau of standards interferometry section, has developed an extremely accurate method of measuring. By a tedious hand grinding process he has made quartz gauges so accurate they can detect errors in distance of less than two ten-millionths of an inch. Two sets of the fused crystals are nearly completed and will be sent to laboratories in Europe to be calibrated. If Mr. Peters' calculations are verified, it is expected an international conference will follow to give the world a new and revolutionary standard of fine measurement much more accurate than that now in use by the bureau of standards and other governmental agencies.

STREAMLINE TAXICAB HAS TRANSPARENT TOP

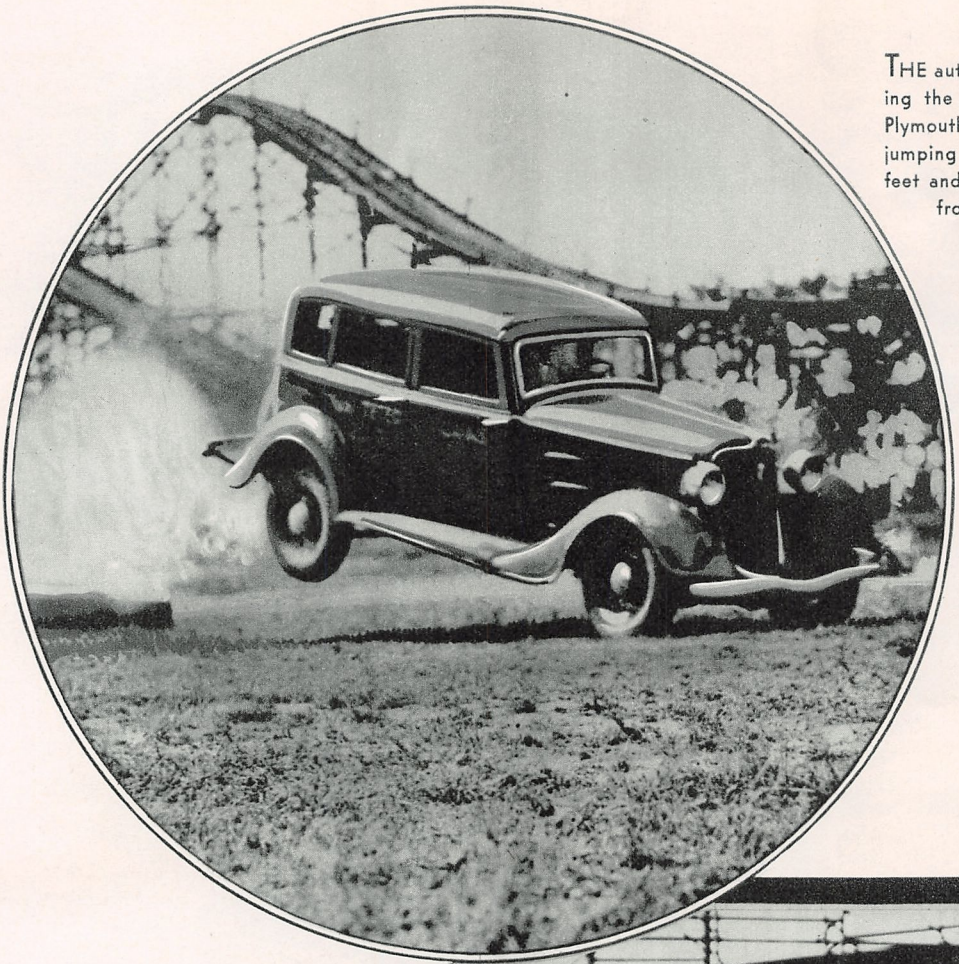
Intended to attract attention and patronage by its attractive lines, a streamline taxicab has been designed and copyrighted by Hal Holtom of Detroit. Among its features are a transparent roof inset and concealed lights in the radiator shell, giving the effect of illuminated grill bars.



Streamline Cab with Transparent Inset in Roof

"LUCKY" Teter, stunt driver and author of this article, is about to take a bath. He is plunging into a lake after driving his test car down a chute to gain the necessary momentum.

BREAKING THEM UP TO MAKE THEM BETTER



THE author demonstrating the sturdiness of a Plymouth by broad-jumping it twenty-five feet and landing on the front wheels.

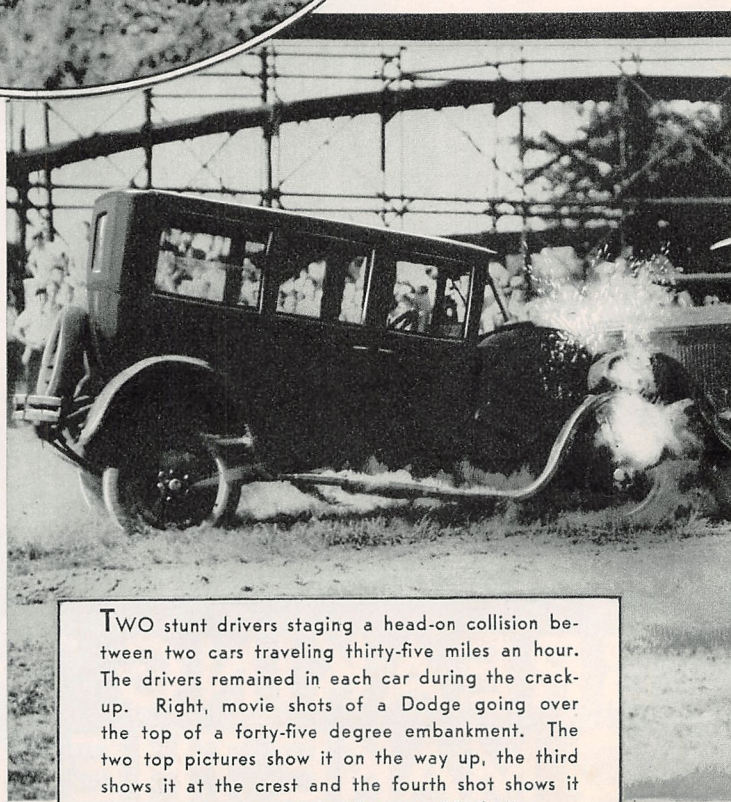
By E. M. "LUCKY" TETER

Automobile Stunt Driver

I EARN a living by turning cars upside down at seventy miles an hour to produce thrills that demonstrate the ability of the modern automobile to "take it."

My friends call me "Lucky" because I manage to stay out of hospitals. You would probably call me a reckless driver. But my wrecks are not reckless. I don't believe in taking unnecessary chances. And in my business of turning cars upside down safely, I have learned a few things about driving them right side up safely.

But first, how about taking

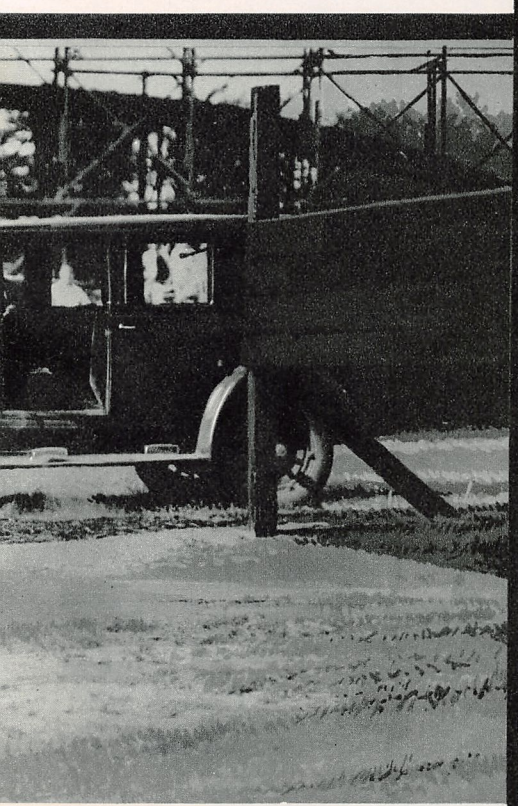


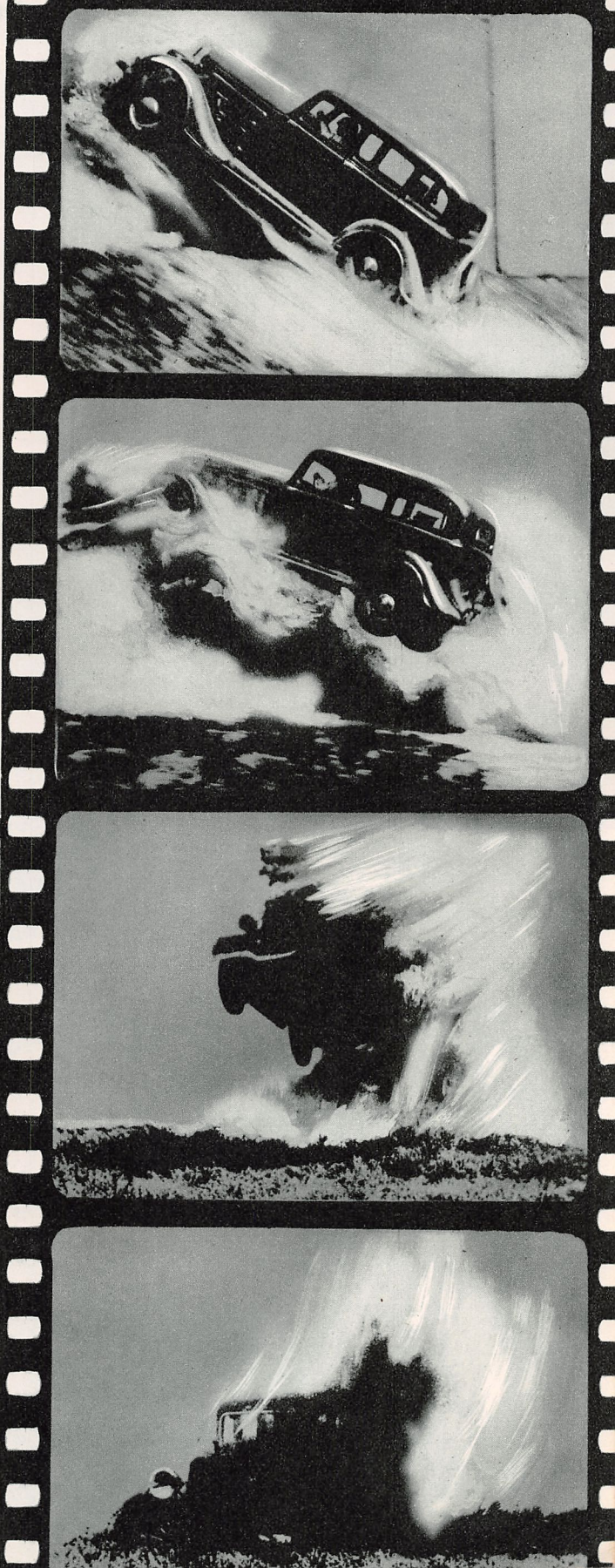
TWO stunt drivers staging a head-on collision between two cars traveling thirty-five miles an hour. The drivers remained in each car during the crack-up. Right, movie shots of a Dodge going over the top of a forty-five degree embankment. The two top pictures show it on the way up, the third shows it at the crest and the fourth shot shows it coming to earth after its "flight."

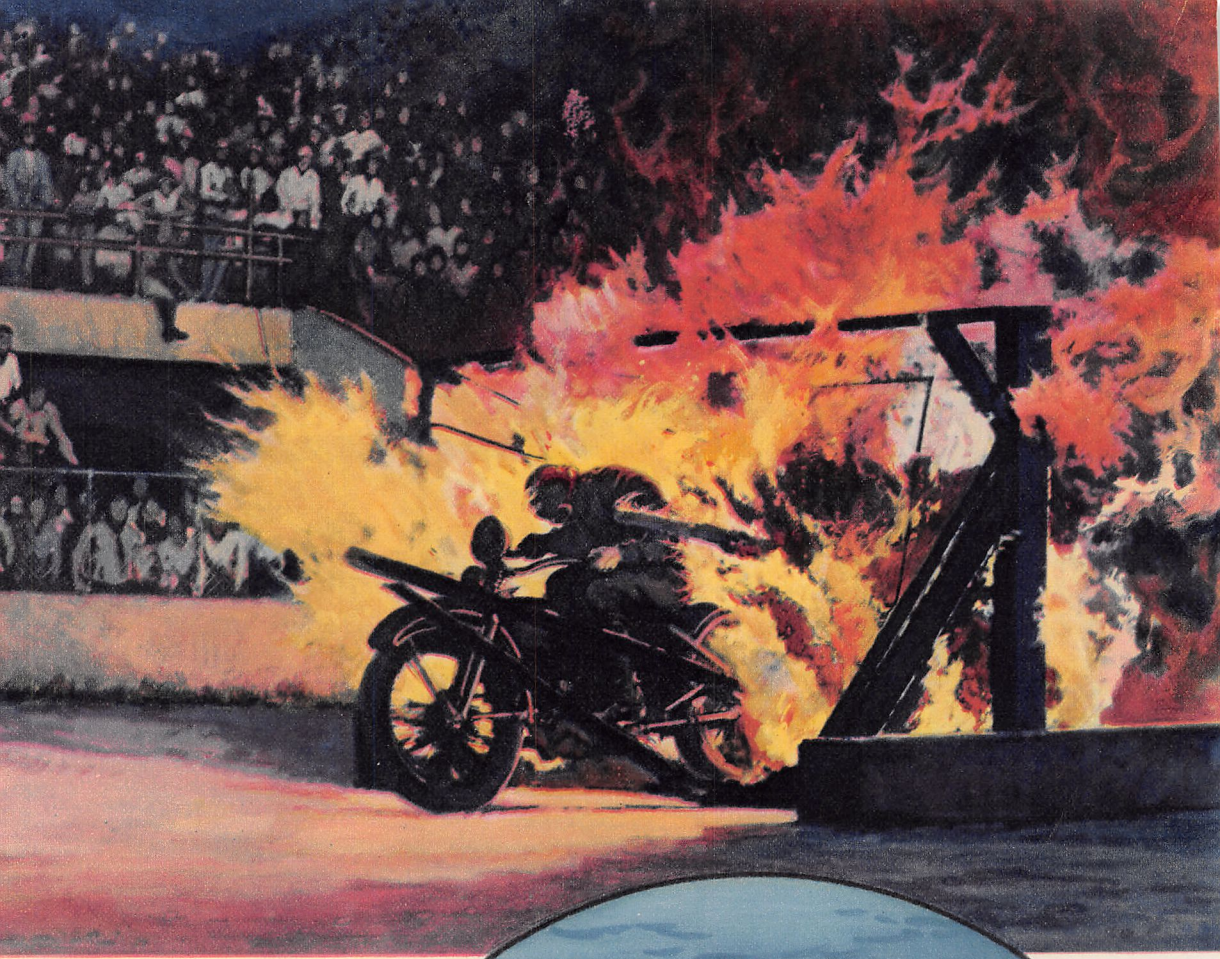
a ride with me? I can guarantee that our car will turn over at least once—maybe more. Here, put on this crash helmet. Strap yourself in the seat beside me with this safety belt. All ready? Hold onto your seat. Here we go.

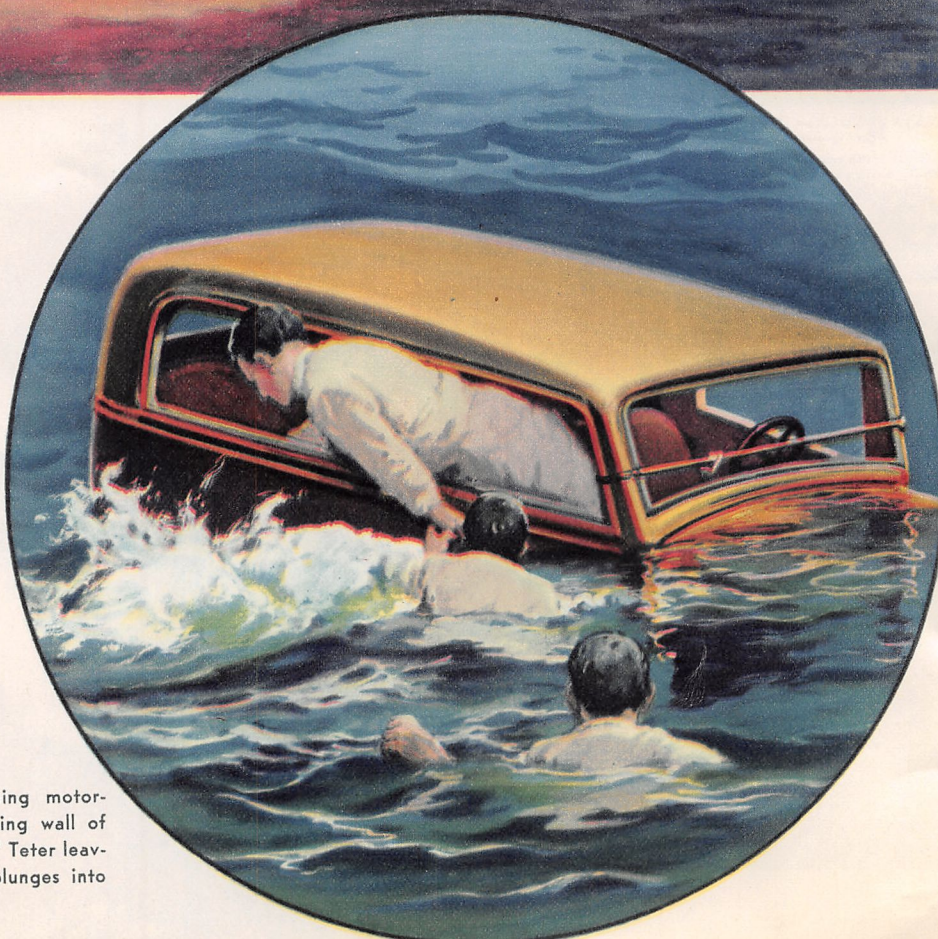
Down the track—twenty miles an hour, thirty, forty, fifty, sixty—the speedometer creeps to seventy. Hang on, now's the time! Twist the wheel sharp right—hear those tires scream. Now we're starting over—we're leaving the ground—watch out for the crash. That first bump was when we hit on the side, now over again, and that smash was when we hit on the wheels.

Look out—we're going again. Feel your weight strain against the safety belt. Your head hit the top then. Good thing you wore that helmet. There—we landed on the side.







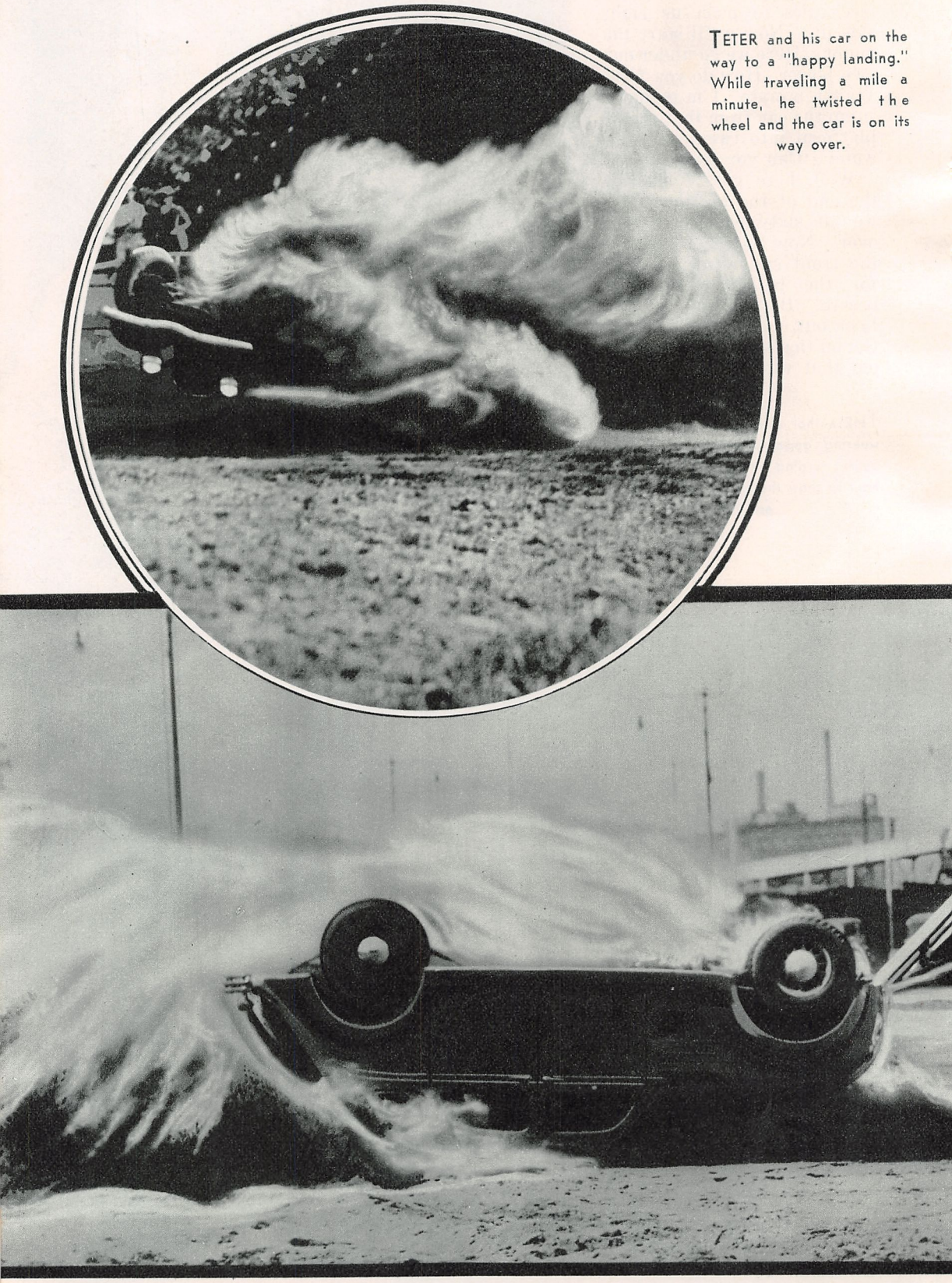


STUNT driver riding motorcycle through flaming wall of boards and "Lucky" Teter leaving his car as it plunges into a lake.

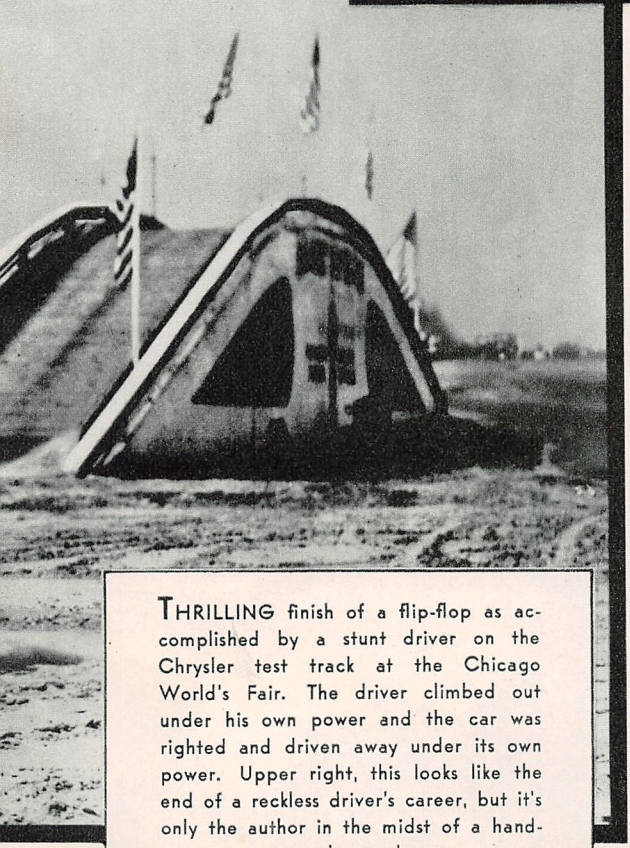
Don't move—here are the mechanics to push us right side up. Now we'll start the motor. Here we go under our own power. How do you feel? Wait a minute. I'm going to jump the car from that raised platform into twenty feet of water. Can you swim?

Well, here goes! There's the end of the platform and we hit sixty when we went over. Now watch us sail, see the front end settling. Now for the bath. Hold your breath. Boy, what a splash! Look out, we're turning over. Get off that safety belt and get out that window. O.K., now

THE author strapped in his seat and wearing goggles and crash helmet. Below, turning over at sixty miles an hour to show the stamina of the modern car.



TETER and his car on the way to a "happy landing." While traveling a mile a minute, he twisted the wheel and the car is on its way over.



THRILLING finish of a flip-flop as accomplished by a stunt driver on the Chrysler test track at the Chicago World's Fair. The driver climbed out under his own power and the car was righted and driven away under its own power. Upper right, this looks like the end of a reckless driver's career, but it's only the author in the midst of a hand-made wreck.

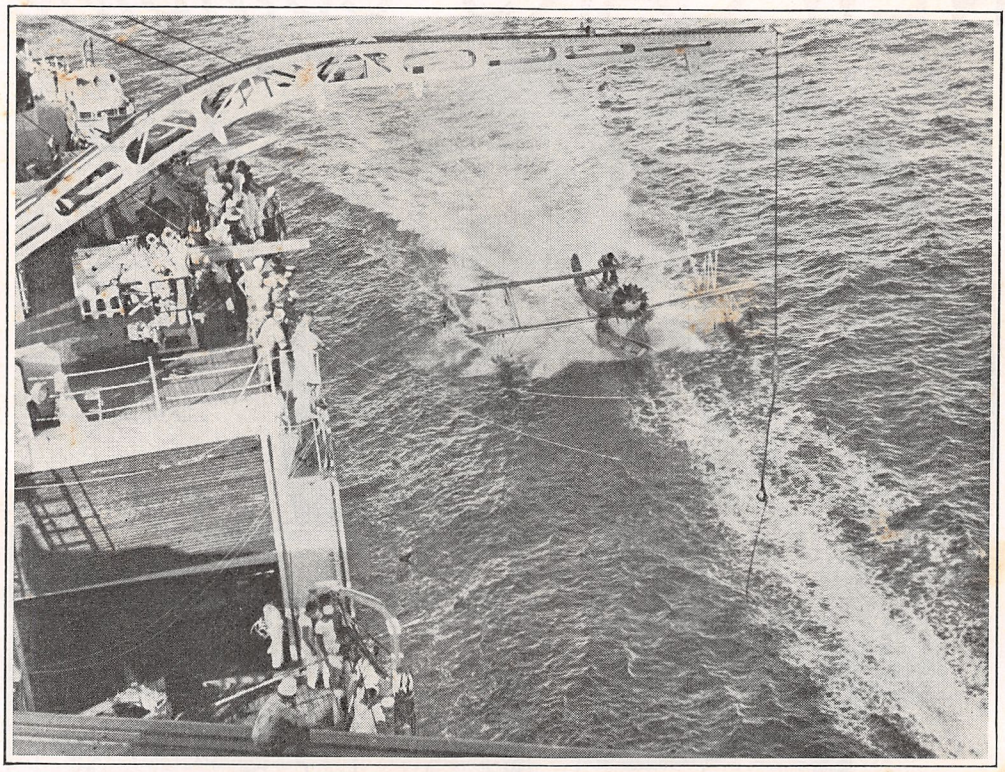
for a nice cool swim to shore. Wait until they pull the old bus out of the lake. Now let's see if it will run. Yes, she starts—and away we go. Hear the crowd yell. You're a hero!

That's the way it feels to make accidents. I've been manufacturing thrills for almost a year, traveling from one city to the next to appear before excited throngs. It's a strange job—this business of making thrills with spills. But I like it. I like the roar of the crowds. I get just as much fun out of the turnover and water-jump stunts as the spectators.

The other stunts in my repertoire are almost as exciting. The ski jump, for instance. It's a real treat to jump my car as far as fifty-two feet. Of course I do my stunts for money. But there's another reason. I believe that my experiences are of real value to automobile engineers and motorists. I like to feel that I'm contributing something to automotive *(Continued to page 116A)*

STUNT driver starting to turn upside down. Forcing cars to take such punishment may seem like cruelty to autos to the man who loves things mechanical, but if he were involved in the accident illustrated, he would be safer if he were in a car which was sturdy enough to stand such punishment.

Ship Hoists Planes to Deck without Stopping

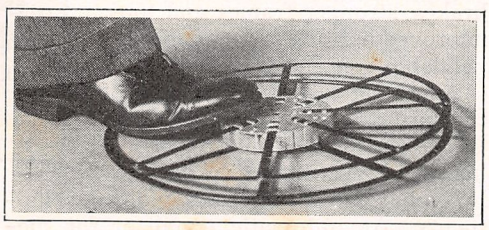


Seaplane Being Taken Aboard Cruiser with the Boat Proceeding at Full Speed; the Plane Runs onto a Net and Is Then Hooked by a Crane and Raised to the Deck

Seaplanes returning from flights at sea to the mother ship can now be hoisted to the deck of a cruiser without stopping the vessel as formerly. The plane runs up on a net which is towed by the cruiser. The pilot then stops his motor as a hook on the pontoon engages the net and keeps the plane abreast of the crane which raises it to the deck. This method is also safer since the plane's motor is dead when the plane is hooked onto the crane, eliminating the danger of the propeller striking the hook.

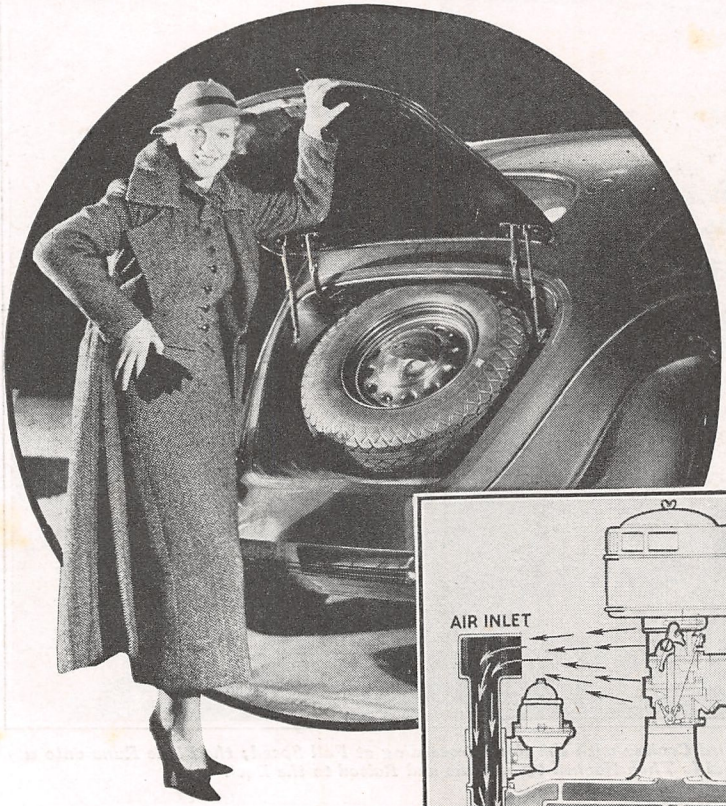
FILM REEL OF SPRING STEEL HOLDS ITS SHAPE

Dishproof and long wearing, the latest reel for motion-picture film has rims and spokes made of spring-steel bands to prevent permanent bending and twisting out of shape. The spokes are riveted to the rims, but slide under steel bands at the hub, permitting free movement under strain. A space at the bottom of each spoke provides for molecular expansion which occurs when metal is subjected to violent strain. One feature of the reel is automatic threading. The operator simply lays the film over a well in the top of the hub, then presses the film into the well with the fingers. Once in the well, the film is automatically threaded. The reel is for sixteen millimeter film and holds a strip 1,600 feet long.

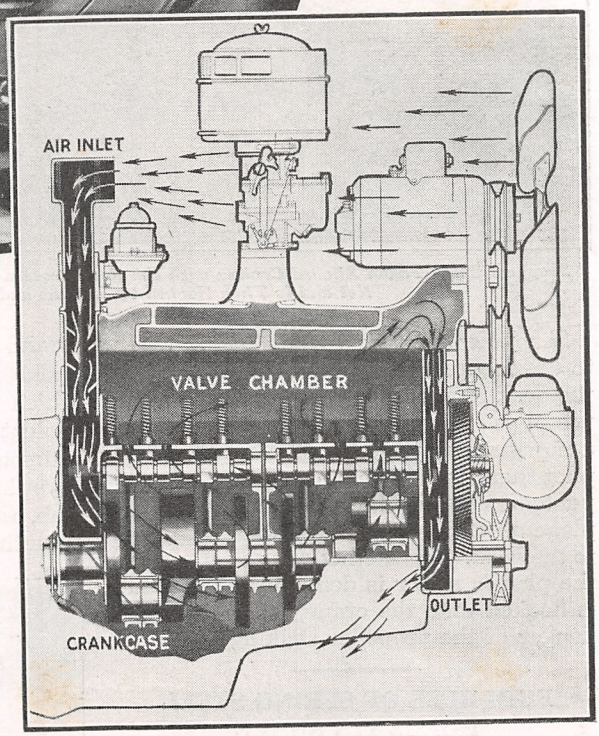


Stepping on Film to Show Its Durability under the Most Severe Handling

NEW CARS *Combine*



Left, Spare Tire of Airflow DeSoto Coupe Fits into Special Compartment in Rear Deck; Below, Ford's Directed Flow Crankcase Ventilation System; Air Is Forced by Fan into Screened Scoop (Back of Motor) and Down into Crankcase, Then Up into Valve Chamber and Finally to Outlet, Carrying Away Vapors and Fumes Before They Can Condense and Dilute the Oil

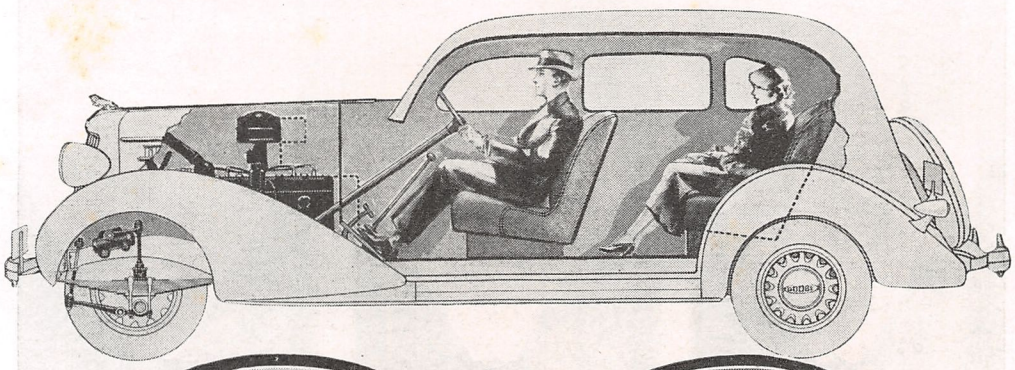


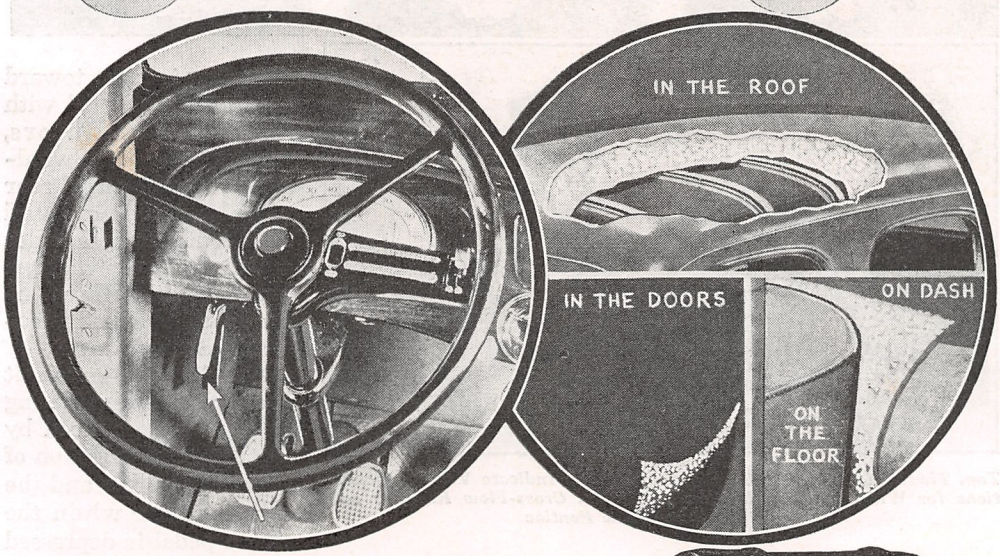
THIS is a year of ease for the new car owner, a year of comfortable riding and greater safety. An armistice in the battle of speed has been declared by most manufacturers and instead of increased horsepower, we find wider seats, "softer" springs, more powerful brakes, stronger frames and tops, improved lighting systems and dependable steering featured.

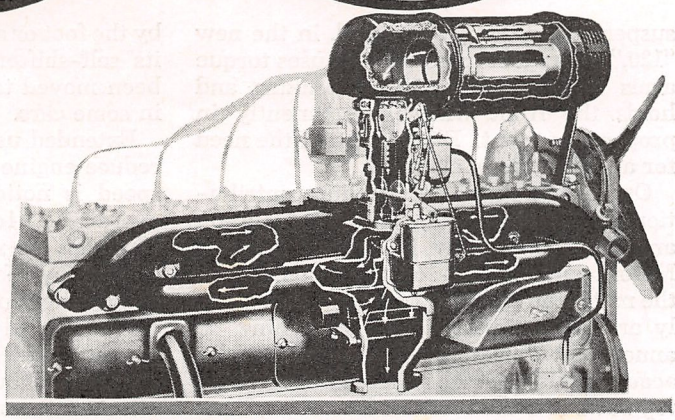
Appalling traffic death tolls of the last few years have resulted in a trend toward more effective brakes. The swing to the hydraulic type is one of the year's major developments. An automatic equalizer for mechanical brakes appears for the first time, offered to keep pressure equally adjusted on all wheels. Brake drums are improved, the centrifuse type being popular. Oldsmobile and Pontiac use a high manganese steel to resist scoring, while the Ford drums have additional ribs to increase the cooling area. Important is general adoption of a hand brake that works independently of foot equipment.

Redistribution of weight is gaining ground. Many manufacturers have moved

COMFORT *and* SAFETY

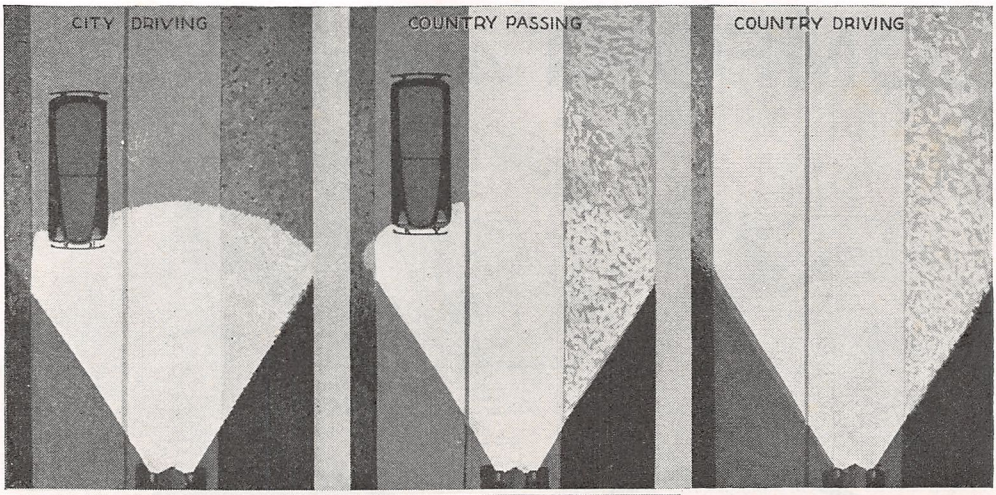


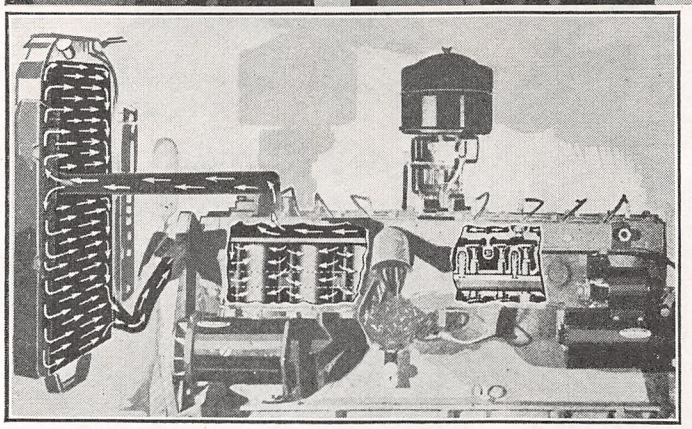




Top, Dodge's Front Suspension and Equalized Weight Distribution; Dotted Lines Indicate How Motor Was Moved Forward; Center, Left, Hudson's Electric Gearshift; Arrow Points to Hand Brake Lever; Right, Cutaway Views Show Insulating Materials Used in Pontiac's Steel Top and Body; Bottom, Oldsmobile's Air Cleaner Takes Air from Fan

the engines forward in the frame, ranging from one inch in some cars to more than eight inches in the Ford. Rear seats have been moved ahead of the rear axle to produce a better ride. Chrysler Corporation has developed a steel known as "Mola," which permits the use of thinner spring leaves with tapered ends. A greater number of leaves are used to build up the spring which has a "soft" action. Some cars have abandoned independent wheel





Top, Three Views of Pontiac Lighting System Indicate Varying Conditions for Which It Was Designed; Bottom, Cross-Flow Radiator and Cooling System of the Pontiac

suspension, although Packard, in the new "120," offers a suspension that uses torque arms to take the action of braking and holds the front wheels permanently in proper alinement. Elimination of the need for adjustments is claimed.

One of the year's outstanding contributions is the steel roof, offered by Hudson and by Fisher Body in several General Motors cars. Added to the all-steel body, the metal top extends protection completely around the passenger. Drumming, so annoying to passengers, is eliminated by acoustic felt or other padding between the top bows and the roof. In Chevrolet, Pontiac and Oldsmobile, the seamless metal roof panel extends from the top of the windshield opening to the rear to include the entire rear window opening.

Styling is more toward the "streamline," with narrower radiators, greater slope of windshield, more slanted rear panels, more rounded roof contours and wider doors. Seats are wider, a comfortable "three-in-the-front" ride being featured in many cars.

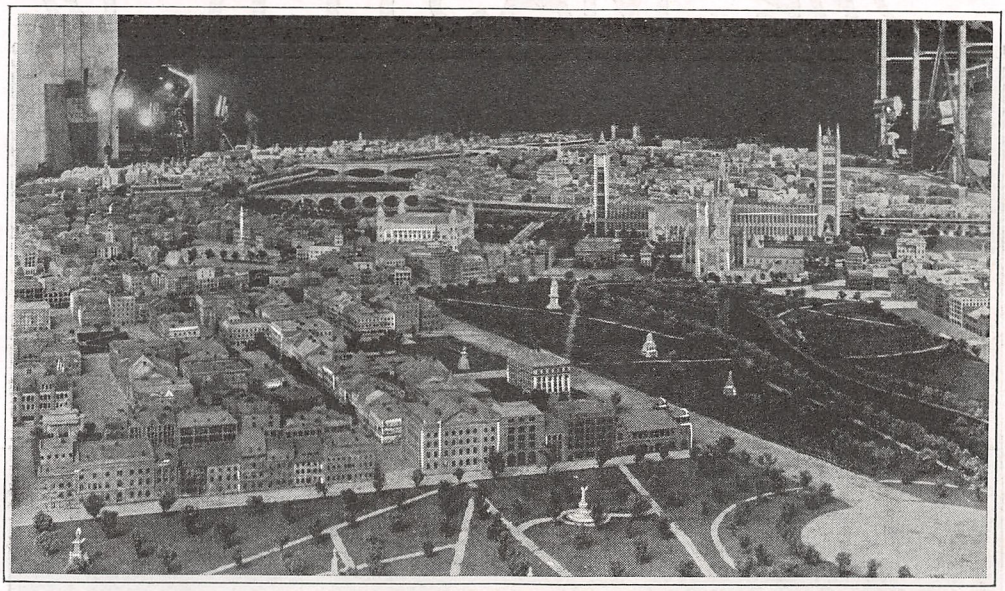
An electric gearshift located on the steering column is introduced by Hudson. Pre-selection of gears is possible and the shift is made when the clutch pedal is depressed by the foot or automatically. Reo continues its self-shifter. Hand brake levers have been moved to the left side of the driver in some cars.

Extended use of a gear above "high" to reduce engine speed without reducing car speed is noticeable. Dual ratio and the overdrive, pioneered by Auburn and Chrysler, are retained and "cruising gear," offered by Nash, and "super-range," by Studebaker, are newcomers.

The hypoid rear axle is a feature that permits bodies to be built closer to the ground without a bow in the floor to accommodate the drive shaft housing. The construction causes the pinion gear to engage the ring gear below center, giving greater gear contact and longer, quieter

(Continued to page 133A)

Model of London Built in Making Movie



This Model of the Heart of London Cost About $200,000 to Construct; It Was Built for Making a Movie Depicting the Bombing of the City during the War

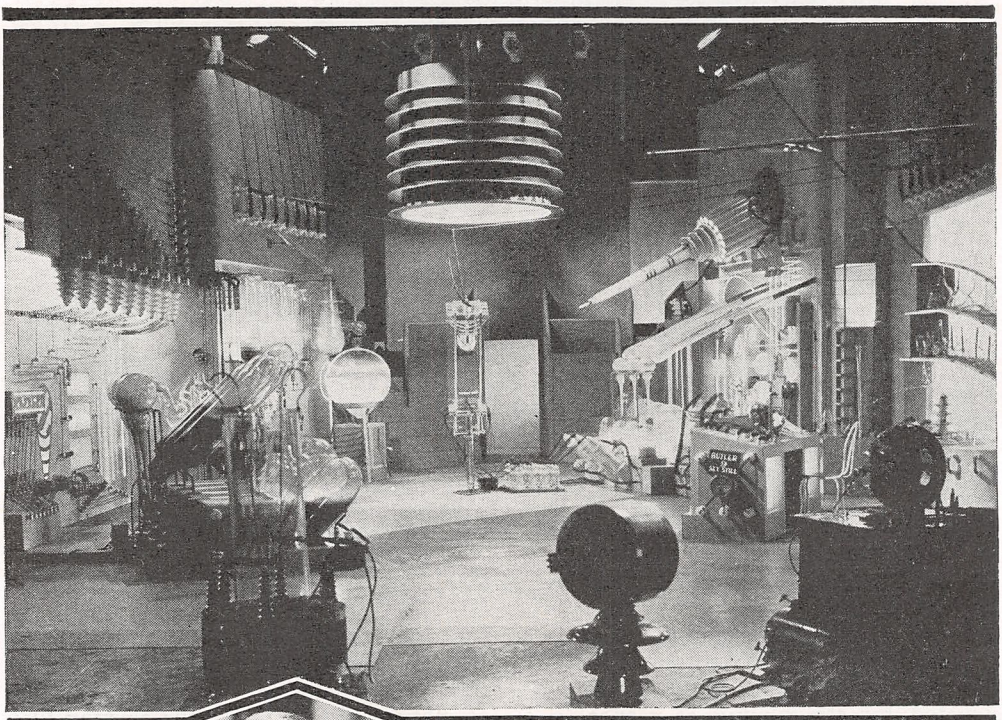
London has been built in miniature in a big dirigible hangar at Arcadia, Calif. The model of the heart of London was constructed for the filming of scenes in a moving picture dealing with the bombing of the British metropolis during the world war. The model cost about $200,000 to build, and required hundreds of workmen several weeks to complete it. The city was not complete when the accompanying picture was taken, but the view represents a section of London about three miles wide and eight miles long.

GLASSWARE FILM IS PREVENTED BY DISHWASHING COMPOUND

One of the disadvantages of mechanical dishwashers has been that an insoluble film usually forms on glassware and china when ordinary cleansing agents are used with the average city water which is more or less hard. This film can only be removed by hand scouring and rinsing in distilled or thoroughly soft water. To eliminate this difficulty, a special dishwashing compound has been developed by the Mellon Institute. It is composed of forty per cent sodium metaphosphate, fifteen per cent trisodium phosphate monohydrate, forty per cent sodium metasilicate pentahydrate and five per cent sodium hydroxide. This compound is said to prevent the formation of film on dishes cleaned in a mechanical washer, no difference how hard the water or how greasy the dishes. It is also claimed the compound does not corrode aluminum utensils.

Glassware at Right Washed with New Compound, That at Left Cleaned by Ordinary Methods

The MASTER of



Examples of Movie Shots in Which Complicated Electrical Apparatus Is Playing an Important Part

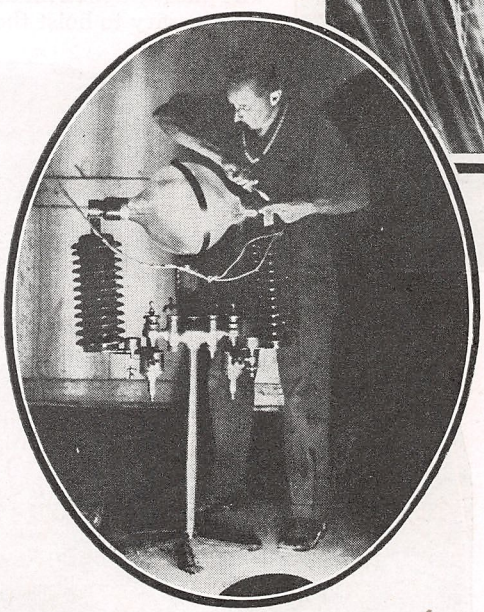
A FEW years ago Kenneth Strickfaden, a world war veteran, started experimenting with electricity in his home workshop. Today he provides many of the weird electrical effects seen in moving pictures.

He began his experiments with a simple Tesla coil, such as any hobbyist might build in his garage or basement workshop and developed many pieces of equipment of his own design and worked out sensational and bizarre electrical effects for his own amusement. When a vogue for the mystery thriller picture hit the studios, the young experimenter got his chance to develop into the screen's foremost inventor of horror devices. His first work was the creation of the realistic sound of an electric chair snuffing out its victim's life. A high frequency current sent

MOVIE THRILLS

through a piece of wood did the trick. The resistance the wood offered the current produced a sizzling sound and the smoke drifted across the set producing a realistic effect.

Next he blew up a tree with lightning for a movie. It was just a matter of running some wire up a "prop" tree. The high voltage generator did the rest. There was a flash of light as the tree crashed and demolished a native hut as it fell. Then he rigged up a rotary spark gap for a wireless station sound effect on board ship. A high voltage spark condensed to give out a pleasing tone accomplished the result. A more difficult stunt was the building of a machine

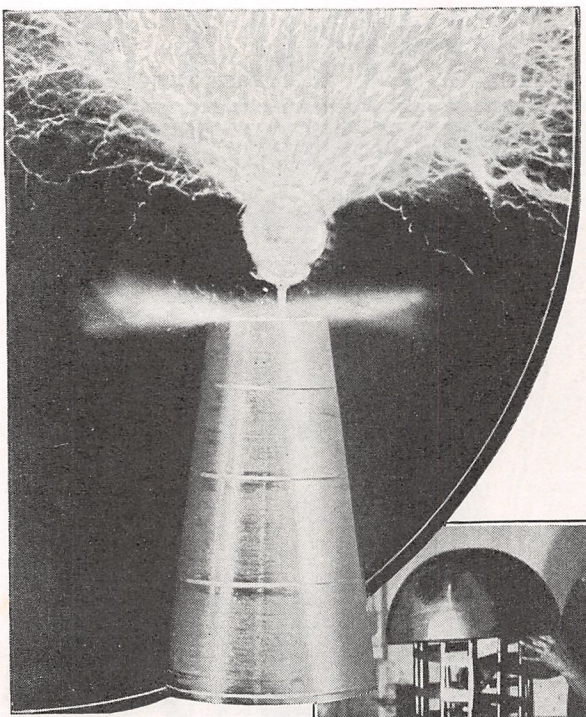


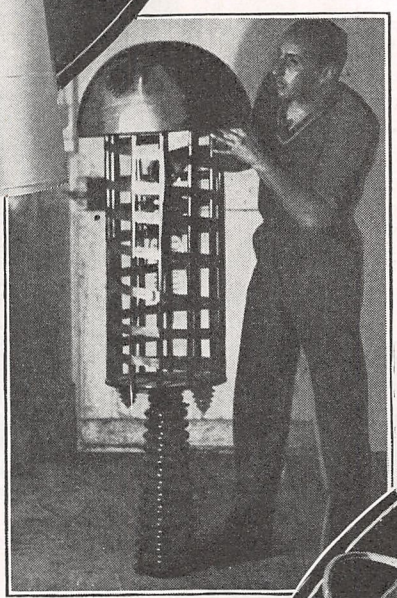
Mr. Strickfaden Working on Apparatus to Be Used in a Movie Scene and Posed with Electrical Effect He Has Created

supposed to send out a ray that would interfere with the ignition of an automobile. It consisted of a boxlike cabinet with a complex array of lenses, bulbs, coils, and dials. It was definitely a "prop" but it was authentic enough to seem capable of sending out all kinds of rays.

In the picture, "Frankenstein," the script called for the tapping of lightning to give the monster Frankenstein life. For this Strickfaden devised a piece of apparatus based on the principle of the horn gap and dubbed it the lightning bridge. The construction of the set and the requirements of the sensational effect desired necessitated moving half a ton of equipment overhead where it was very difficult to work.

The type of picture based on weird elec-

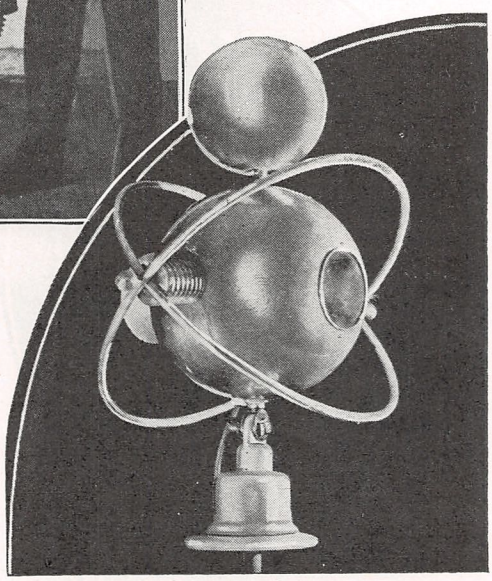




trical effects makes a difficult job for the technician for it calls for authentic apparatus that will perform sensational feats usually possible only in large electrical research laboratories furnished with thousands of dollars worth of equipment. Not only must effects be produced to satisfy the requirements of the story, but this or that space must be filled with a specially constructed piece of apparatus for atmosphere even though it plays no part in the electrical effects achieved. The electrical expert is expected to have in stock every conceivable kind of apparatus.

"If a picture requires a special type of machine that no one has ever heard of, I always assure the director that I have it," Mr. Strickfaden said. "Then I go home and work until I have a machine that will fulfill the need."

He pointed to an intricate and dust-covered piece of apparatus in a far corner of the laboratory. "That," he said, "was used on one of the sets for a 'Connecticut Yankee in King Arthur's Court.' It was supposed to have the power of bringing back the sounds of past ages. I called it the retrogressive wave charger. It was used in connection with a high frequency generator which produced artificial lightning. In those days before directors had learned the full possibilities of electrical effects, life was simple. In later pictures, like 'Chandu,' studio officials wanted sparks all over a gun, they wanted the barrel to melt, and as a final touch the handle of an electrical control must be burned off and drop to the floor. This called for the handling of huge amperages to produce instantaneous heat, and the use of complicated and delicate resonator apparatus to produce a spark six feet long. To make matters worse the conditions under which the scene was photographed made it necessary to hoist the



High Frequency Apparatus in Action and Other Apparatus Designed for Electrical Effects in the Movies by Mr. Strickfaden

apparatus overhead."

When an actor demurs at getting chummy with built-up amperages and high frequency current, and when trick photography cannot be used to achieve an effect, Strickfaden doubles for the timid actor.

"I have confidence in my knowledge and in my apparatus," he explained, "but there is always the possibility of an accident."

During the filming of "The Mask of Dr. Fu Manchu," Boris Karloff, playing the part of the Chinese scientist, was to transfer a six-foot 1,500,000-volt arc from the ball terminal of a piece of mysterious apparatus to a sword which was to be tested. He was to approach the roaring apparatus and calmly intercept the flame on his long Chinese fingernails and direct it to the sword which would or would not melt as its genuineness would determine. A brass sword and one made of gilded wax and magnesium powder were used.

In doubling for Karloff, Strickfaden used every precaution possible. A wire concealed under the clothing was run from the copper fingernails to the resonator apparatus ground through a safety gap. Everything was set for a take. The low hum of the apparatus swelled in volume as the arc developed from the electrode to the tips of the coppered fingernails. Just as the spark reached its full intensity and Strickfaden was about to transfer it to the sword, he did a spasmodic back flip with the fire still streaming from his fingernails. The power was cut off, the cameras stopped and the dazed double was helped to his feet. The cause of the trouble was soon found. Smoke led to the cable carrying 70,000 volts from the transformer to the rotary gap. The cable had punctured and

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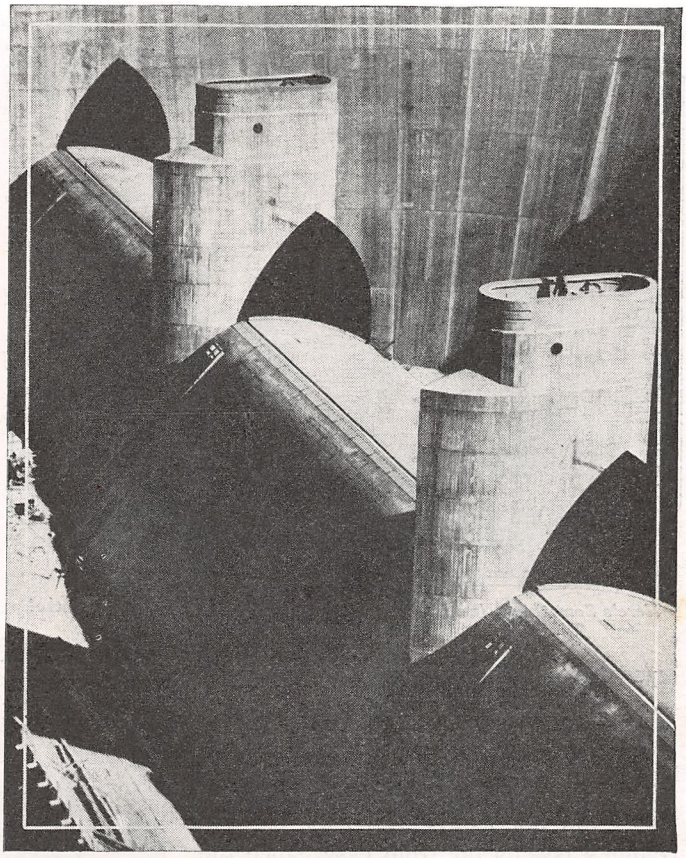
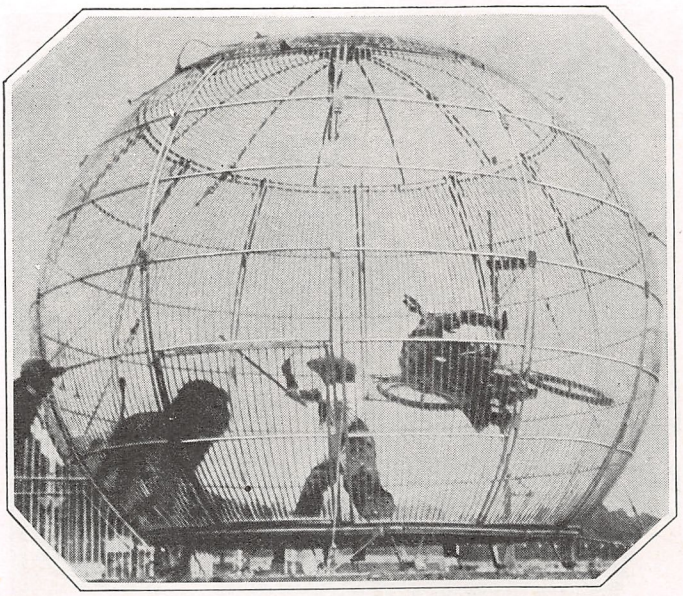


Strangely Like the Towers of an Ancient Castle or Fort, These Huge Gates Mark Another Milestone in Building of Boulder Dam

GIANT GATES OF BOULDER DAM LIKE ANCIENT FORTRESS

To the camera's eye, the giant steel gates of Boulder dam closely resemble the towers of some ancient fortress. With the sun at just the proper angle, portions of the gates appear in lights and shadows that add further to the illusion. Recently installed to form the overflow edge of the Arizona spillway, the gates are sixteen by 100 feet and can be raised and lowered to regulate the flow of water over the spillway. Already 625 feet above bedrock, the dam is approaching rapidly its final height. Thus, its height from bedrock would dwarf the 555-foot shaft of Washington's monument. Storage of water behind Boulder dam will be started within a short time after completion of the huge project. This will be the first step in supplying power from the dam to far western regions.



Here's Something New in Thrills; Trainer Keeps Lions under Control While Motorcycle Roars around on the Bars of Cage

MOTORCYCLIST IN LIONS' CAGE LATEST AT CIRCUS

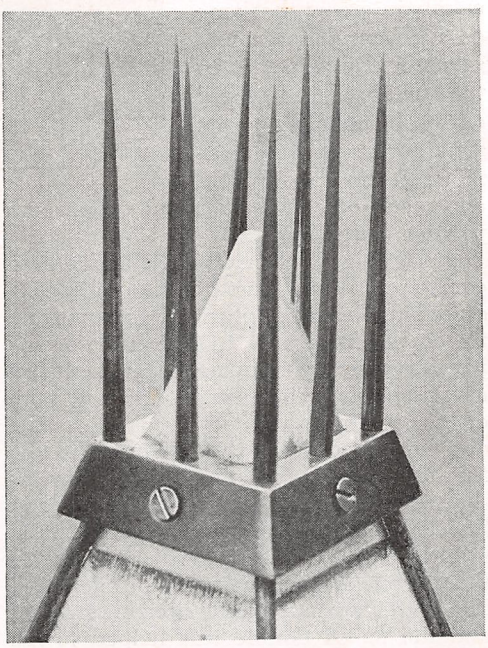
Among the latest circus thrills is the riding of a motorcycle around the inside of a ball-shaped lions' cage while the trainer keeps the big cats under control. The trainer's task is far from easy, since the roar of the motorcycle excites the lions. Constructed of steel bars to form a large ball, the cage resembles the skeleton of the motorcycle arena found at carnivals, except that bars instead of wood form the floor or track for the motorcycle. The act, now being presented in Europe, will be brought to the United States soon.

COPPER PLATING ALUMINUM WITHOUT ELECTRICITY

Germany has developed a method for producing a copper plating on aluminum which will not peel off and which is applied without the use of electric current. Aluminum articles are first polished with an abrasive, then placed in a cleaning bath which is also a preliminary copper plating bath. This treatment removes the coating of oxide on the aluminum and produces a thin copper coating. The articles then are rinsed in plain water, rubbed dry and placed in a second bath when a plating of any desired thickness may be applied by regulating the time the articles remain immersed. Plating produced by this method can be subjected to any further processing without fear that it will peel.

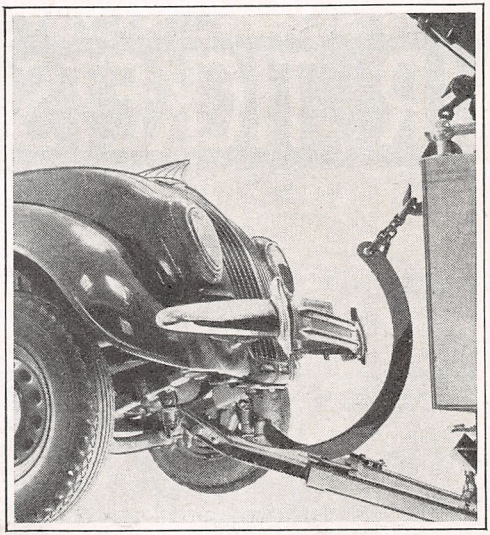
"LIGHTNING RODS" OF PLATINUM AND GOLD

Repairs to the Washington monument were climaxed recently when a lightning cap was installed on the tip of the shaft, giving a close-up picture of the top the appearance of a modernistic birthday cake. Each spike is made of gold and platinum, but the rods seem fairly safe from thieves for it would require a very agile "human fly" to reach them without the aid of the steel scaffolding used by the workmen who installed the cap.



Costly Lightning Rods Cap Washington Monument to Protect It from Damaging Bolts

Universal Lift for Towing Handles Latest Automobiles



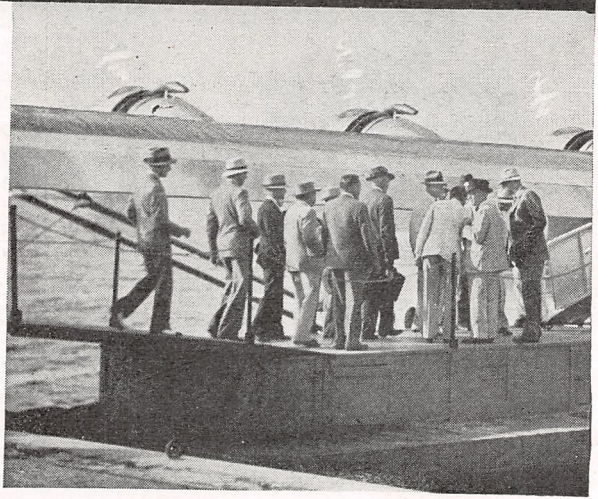
Showing One of the Late Model Cars Being Towed with Lift Adaptable to All Autos

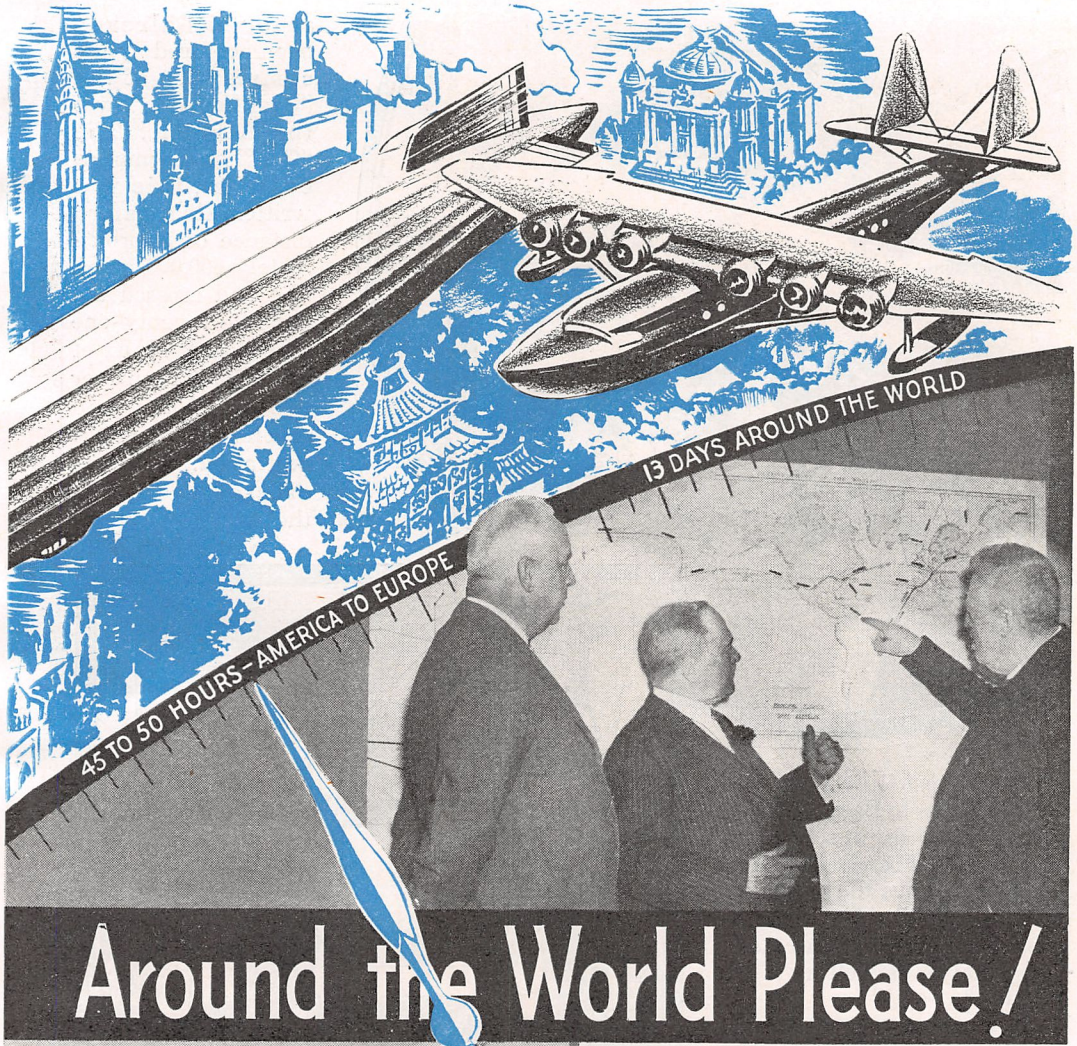
All the latest automobiles with independently sprung wheels, skirted fenders, projecting aprons and other construction features apt to make towing difficult, can be handled with a new type of towing lift. It consists of a derrick suspending a pair of C-shaped arms which are held out from the tow car by a pair of telescoping beams that come together in a "V" at the central point of the axle housing of the tow car. The curvature of the C-arms allows ample clearance for all outward and downward projections, while at the same time the arms take the weight of the towed car in a direct line from the cable pulleys to a point near the "shoes" which attach the device beneath the towed automobile. The "tow" follows the service like a two-wheel trailer, with no sidesway or surging. The lift also will handle old model cars.

¶Radio receivers outnumber telephones in the United States, there being 19,000,000 radios, exclusive of auto sets and homes having more than one receiver, compared with about 11,000,000 home telephones.

flying boats are now being built by Pan-American Air Service for flying between California and China. Pan-American is already operating 3,000 miles of air lines in China, developed with the co-operation of the Chinese government. These lines tie in with European continental lines in the south of China. For the eastward journey of this round-the-world service, Dr. Hugo Eckener, noted dirigible navigator and expert of Germany, expects next summer to start an air service between Germany and the United States across the Atlantic. Dr. Eckener has made arrangements with the navy department for the use of its lighter-than-air base facilities at Lakehurst, N. J., and Miami, Fla., for this service.

Dr. Eckener's plan calls for the eventual development of regular four-day departure service for dirigibles across the Atlantic from Germany to this country. Crossings this way would be made in about fifty hours. While in





Around the World Please!

Top Photo © Underwood and Underwood

Above, Dr. Eckener Pointing Out Proposed Round-the-World Routes; Below, Passengers Landing at Miami from Brazilian Clipper

Washington last fall Dr. Eckener explained the proposed dirigible service as follows:

"A Dutch group, backed primarily by Dutch steamship companies, in cooperation with our Luftsschiffbau Zeppelin has sought and found contact with an interested American group, and the plan has been proposed to organize a combined German-American-Dutch operating company, which would operate in friendly cooperation two main lines, one from Friedrichschafen to South Amer-

Artist's Conception of Life on Passenger Airship of Near Future; Stateroom and Lounge Are Shown

ica, and the other from the United States to Batavia. These lines would cross at some point in southern France or northern Spain. Thus the possibility would present itself to organize connecting lines to Germany and Batavia, as well as to Rio Janeiro."

On a recent trip to Batavia, Dr. Eckener worked out a timetable of about seventy or eighty hours between the European intersecting point of his lines and Rio, from this point to Batavia, approximately 105 hours, and from it to America fifty-five hours. From America to Europe the time would approximate forty-five hours. The South America line of this service has been in operation for the past year or so.

Both the Pan-American service and the Zeppelin service will begin as experimental projects. This experimental period will permit the acquisition of accurate and detailed weather information over the Atlantic and Pacific. Information of this character has already been acquired by the commander of the "Graf Zeppelin" over the Atlantic. The "Graf" had completed, when this was written, 415 trips for a distance of approximately 600,000 miles. She had crossed the Atlantic seventy-one times, sixty-four of which have been over the southern and seven over the northern area. She has crossed the Pacific the Arctic sea, made many trips over the Mediterranean, and covered the continents of Asia, Europe and North America. On all of these voyages, especially the longer ones, she has encountered bad weather. And all of the trips were started on schedules previously worked out. Only once, says Commander Eckener, has she ever been delayed taking off. That was because of local wind conditions which would not permit the ship being taken out of her hangar.

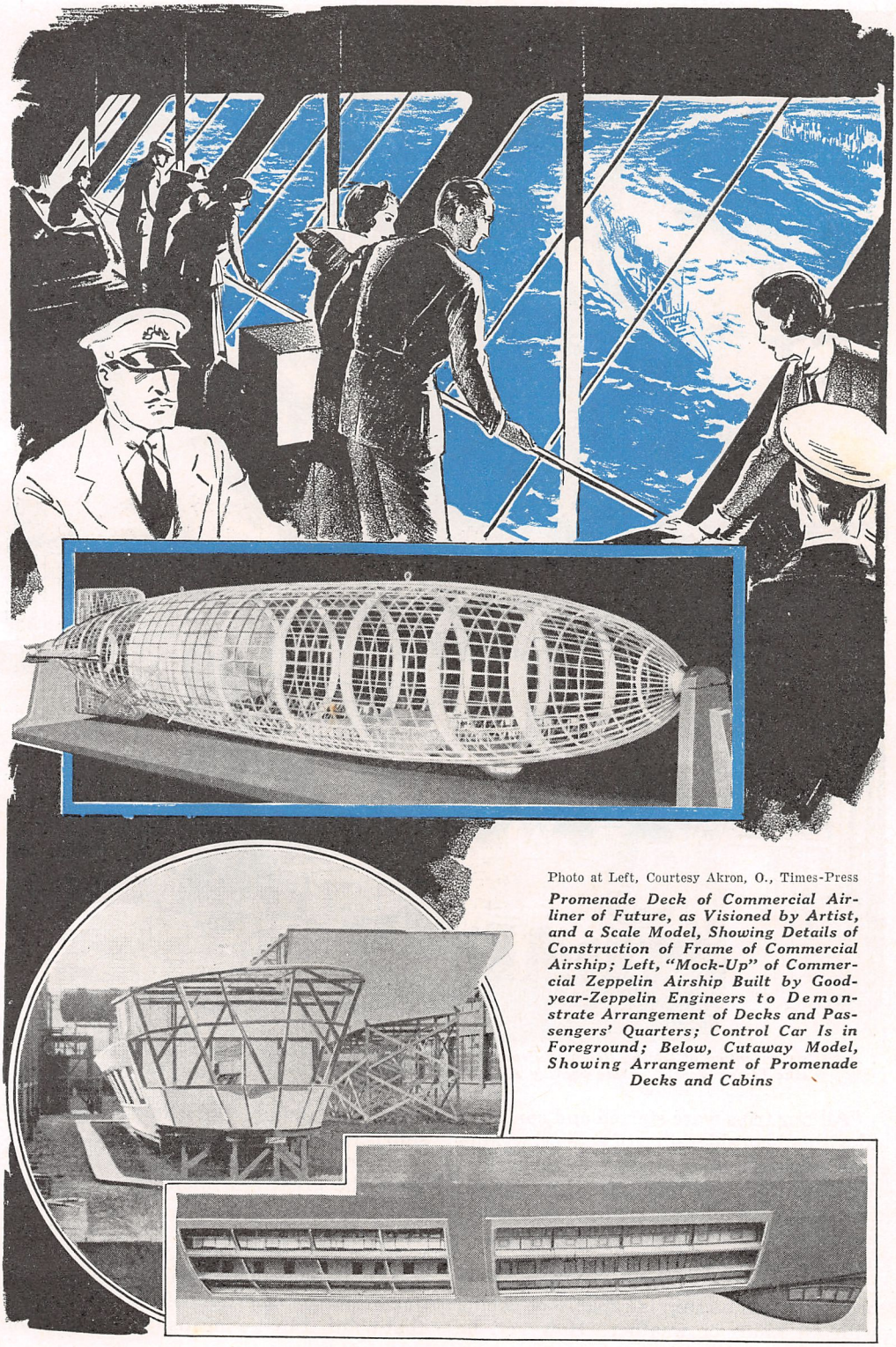
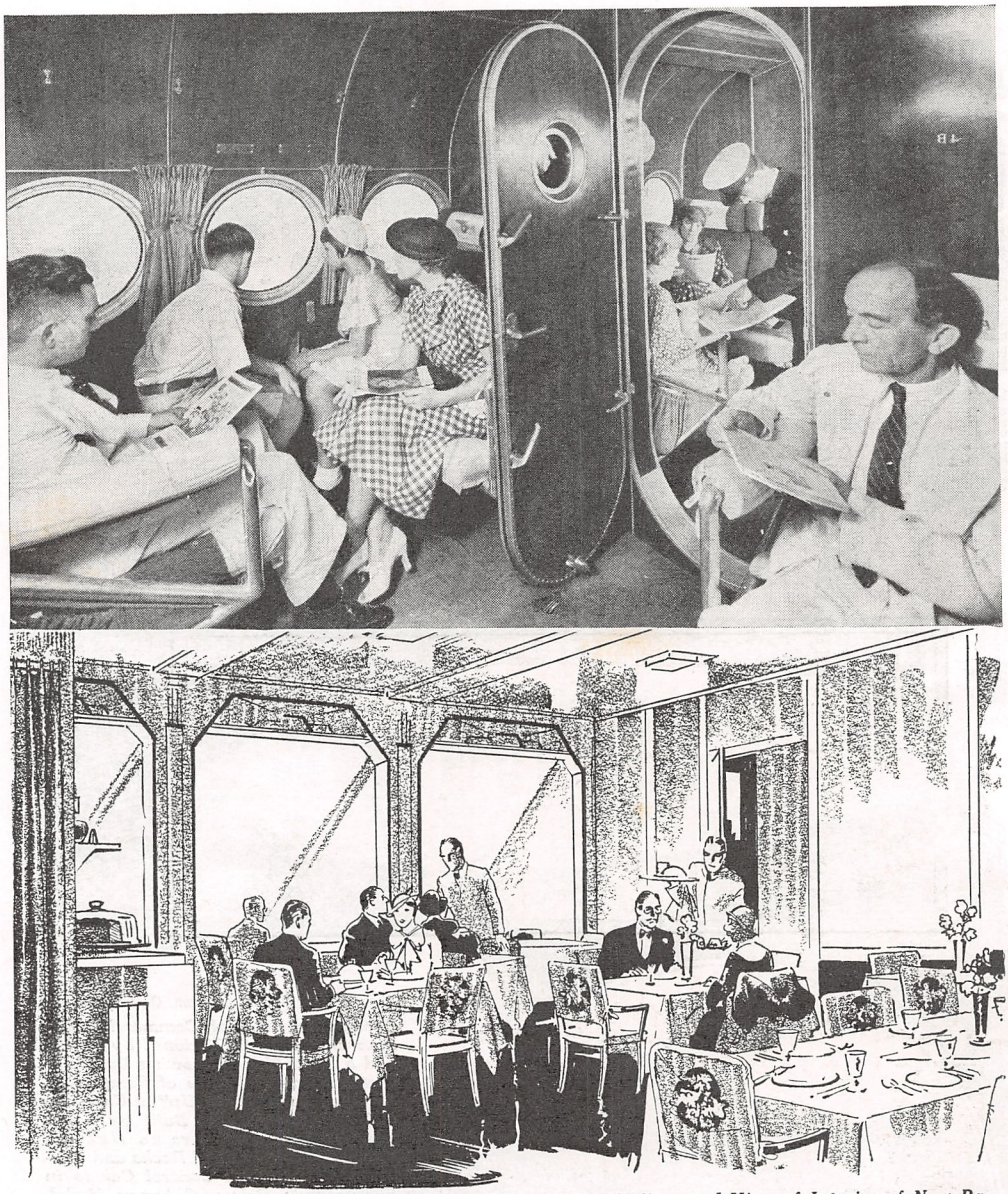


Photo at Left, Courtesy Akron, O., Times-Press

Promenade Deck of Commercial Airliner of Future, as Visioned by Artist, and a Scale Model, Showing Details of Construction of Frame of Commercial Airship; Left, "Mock-Up" of Commercial Zeppelin Airship Built by Goodyear-Zeppelin Engineers to Demonstrate Arrangement of Decks and Passengers' Quarters; Control Car Is in Foreground; Below, Cutaway Model, Showing Arrangement of Promenade Decks and Cabins



Artist's Conception of Dining Room of Proposed Commercial Airliner and View of Interior of New Pacific Flying Boat, Showing Seating Arrangement Providing Window Views for Passengers

"All our trips were started and completed without consideration of general weather conditions," he said. "We never waited for days, as is generally the custom when making long demonstration trips, in order to encounter favorable or advantageous meteorological conditions."

This fact Dr. Eckener cites as conclusive proof that the airship is capable of coping with all kinds of weather. However, he says, he would not like it inferred that the ship is capable of withstanding the "vortex of a hurricane or the center of a typhoon." Even the great sea liners, he points out, avoid these.

"On the famous trip around the world," says Dr. Eckener, "the airship ran into the area of a typhoon, which had crossed the Japanese sea shortly before we reached that point. I by no means tried to give the

vortex of the typhoon, which was pu
out to the northeast, as wide a bert
possible. On the contrary, I was conce
that the typhoon might have moved, b
time we arrived, so far away as to n
it impossible for us to exploit the favor
northerly winds prevailing along the
side of this disturbance. I set our co
running far to the eastward along
coast of the peninsula of Sakhalin, in o
to be able to make use of the north
gales caused by the typhoon. It was
tremely gusty under these conditions.
had to run for hours through thick fog
low clouds, but we had a wonderful n
wind blowing at the rate of fifty and s
miles per hour. The wind brought u
seven hours from the Okhotsk sea to

(Continued to page 126A)

MERRY-GO-ROUND CLOTHESLI RUN BY ELECTRIC MOTOR

Drying the family washing is a sin
matter if you own a merry-go-ro
clothes reel operated by an electric mo
It consists of an upright standard

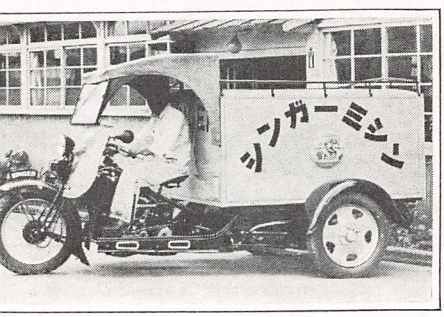
Clothesline Which Is Rotated by a Small Motor,
Motion Resulting in Rapid Drying

braces extending from it to support
reel on which the clothes are hung.
small electric motor revolves the stand
when the clothes are in place and
whirling dries them in a jiffy.

extending through a window or a hole in the wall. As the water lowers the ball drops down and the pump stops. The pump is of brass and the shaft is of stainless steel. The unit has a capacity of 1,500 gallons per hour and is also handy for draining ditches, irrigation pumping or operating lawn fountains.

THREE-WHEELED DELIVERY CAR IS USED IN JAPAN

Three-wheeled delivery cars, a combination of motorcycle and some features of light trucks, are being used widely in Japan because it is claimed they are quicker in traffic, easier to park and less ensive in upkeep than the conventional r-wheeled vehicles. Most such cars ize the standard American type of mocycle, ingeniously fitted to a motor ck type rear-car chassis, but one comy is using a two-cylinder V-type twin ine set transversely in the frame with t clutch and gear box, shaft drive and erential, and automobile type steeron the front wheel. Due to the wedge- front and the fact that the driver sits the center of the car, these three-



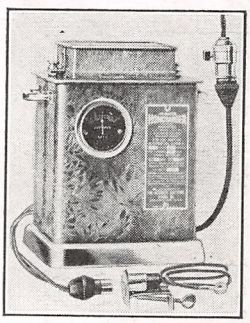
s Combination of Motorcycle and Light Truck Is Used in Japan for Making Deliveries

eeled vehicles can get through traffic re safely and quickly than the usual ivery car. The one front wheel, which

can be turned at right angles, permits parking in any space equal to the car's over-all length, and the cubic capacity of the body is greater for any given wheelbase, due to the fact that the driver is above, rather than behind the engine. A canopy top protects the driver from the weather and the sturdy side frames of the chassis guard his legs. The car illustrated has a motorcycle engine and transmission, a rear axle with an automobile type differential and adequate internal expanding brakes. Three speeds forward and one reverse are provided and it has a maximum speed of forty-five miles per hour.

FASTER HOME-TYPE CHARGER FOR THE AUTO BATTERY

Faster charging of the automobile or radio battery is made possible by a home-type charger that delivers about ten amperes. The charge is tapered as the power level of the battery rises, eliminating the possibility of damaging the battery. The charger works on the rectification principle, with a vibrator unit. The makers claim that the average battery can be charged overnight at a cost of only a few cents. A clamp-on device is used to connect the charger to the battery. Only a single connection is made to the ammeter terminal back of the auto dash. This wire and the clamp are supplied. A special filtering system prevents interference with radio receiving sets.



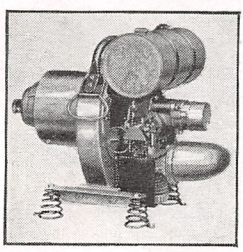
"BLINDERS" HELP PILOTS LEARN TO FLY BY INSTRUMENTS

Pilots seeking training in blind flying are using "blinders" made from ordinary goggles for the purpose. By taping the goggles around the edges, the pilot limits his vision so that, when sitting in a normal position in the cockpit, he sees only the interior of the cabin and the instrument board. A regular pair of goggles is used for the take-off, the pilot donning the blinders when he is in the open. If he gets into a position from which he cannot recover while flying blind, he need only look over the side to see the ground and thus orient his ship. The blinders eliminate hooding the cockpit of a dual-control plane and enable the flyer to practice without the aid of a second man to take off and land for him.

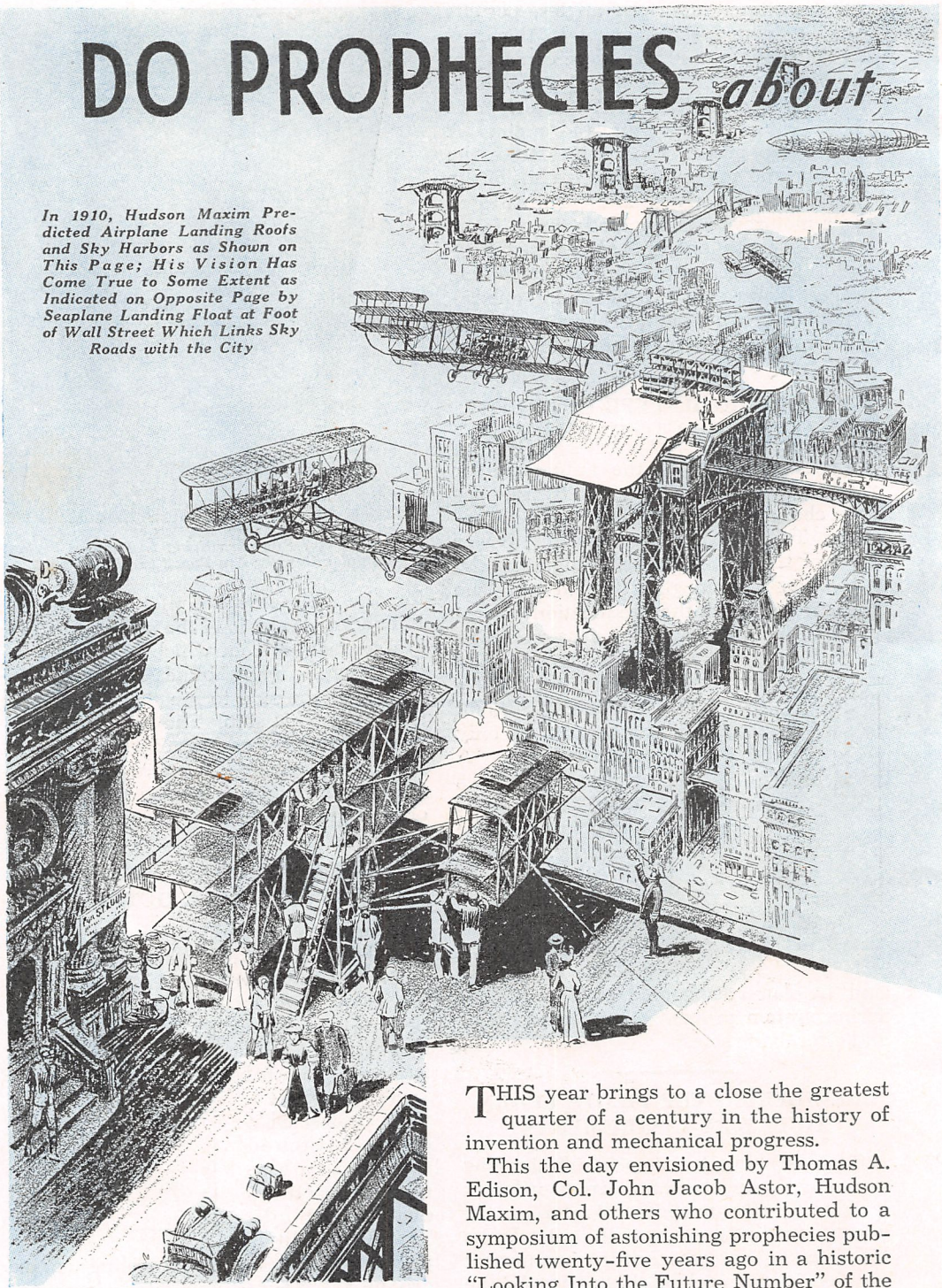
"Blinders" for Pilot Practicing Instrument Flying; Regular Goggles Are Taped to Limit Vision

FLOODLIGHT WITH OWN PLANT IN PORTABLE OUTFIT

Weighing only eighty pounds and contained in an outfit for easy carrying, a handy floodlight with its own power plant has many uses. It is weather and dust proof, fully automatic and needs no adjustment. If desired, it can be attached securely to a base for extended operating periods. The floodlight is powered by a built-in gasoline engine driving a 1,250-watt generator. The plant also may be used for operating electric saws, hammers, drills and other equipment.



DO PROPHECIES about



In 1910, Hudson Maxim Predicted Airplane Landing Roofs and Sky Harbors as Shown on This Page; His Vision Has Come True to Some Extent as Indicated on Opposite Page by Seaplane Landing Float at Foot of Wall Street Which Links Sky Roads with the City

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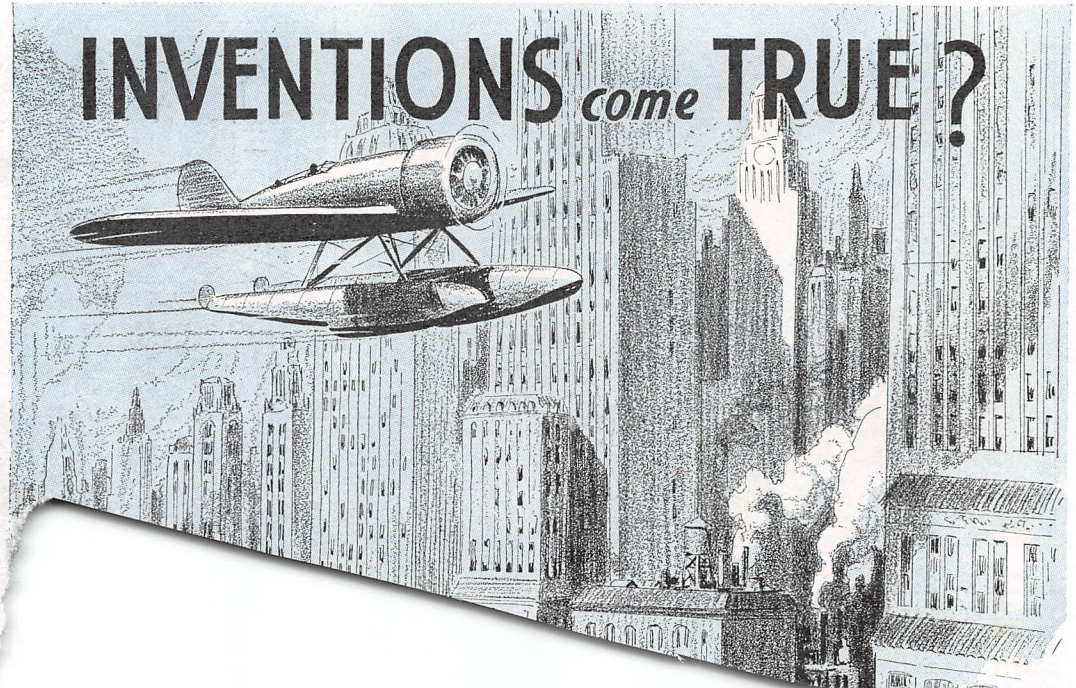
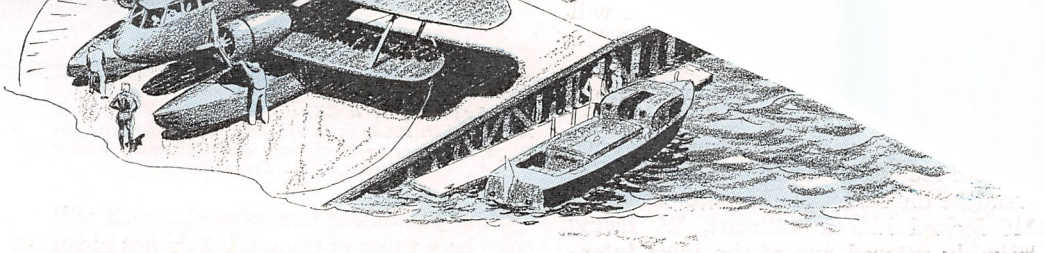
The Drawing on This Page Represents a Prophecy, That on the Opposite Page the Fulfillment

THIS year brings to a close the greatest quarter of a century in the history of invention and mechanical progress.

This the day envisioned by Thomas A. Edison, Col. John Jacob Astor, Hudson Maxim, and others who contributed to a symposium of astonishing prophecies published twenty-five years ago in a historic "Looking Into the Future Number" of the New York World.

In that year, 1910, only seven years after


INVENTIONS come TRUE?



the first airplane flight, Edison made a prophecy that seemed wild and irresponsible to his countrymen, but which has proved accurate beyond a doubt.

"We are face to face with aerial navigation on a scale of which we have never dreamed," said Edison. Then he went on to predict that small planes carrying mail would travel 100 miles an hour and eventually would go much faster. In 1934 an airplane exceeded 400 miles per hour.

"I don't know how to do it," he said, "but a method will yet be discovered of wirelessly transmitting electrical energy from the earth to the motor of a machine in midair. There is no reason to believe it cannot be done."

In this Edison made a prophecy still un-

fulfilled. Scores of inventors are now working on it, however. James J. Hill, the railroad builder, was another who fo[illegible] saw the mighty developme[illegible]

will
is not the

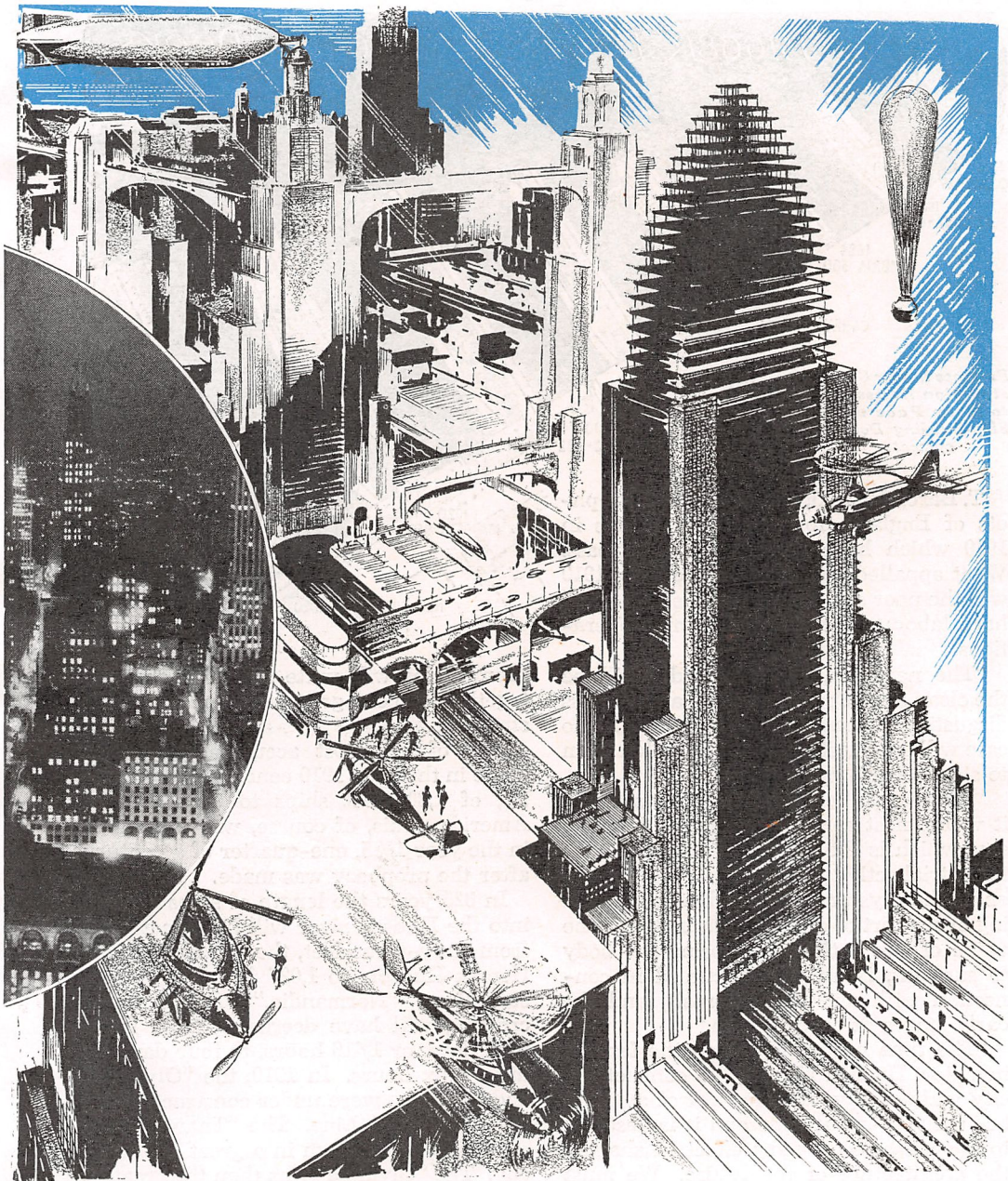
ture ages may prove
different order of being
the present. He may look upon
we today look upon our forbears."

And in the realm of the auto, which in 1910 looked like a milkcart, W. Irving Twombly uttered one of the most interesting prophecies:

"Invention of the future," he said, "will tend toward increased strength of materials, reduction in the weight and size of all moving parts, simplifying and standardizing of all moving parts so that they may be duplicated anywhere in the world at a fair price with the sure knowledge that they will fit in place when received.

The Evolution of a City; Above, New York as It Appeared in 1884; in Circle, as It Is Today, and, on Opposite Page, as Architects and Engineers Vision It Twenty-Five Years Hence

"The pneumatic tire as we know it will soon be a thing of the past. I do not mean that it will ever be successfully replaced, but I predict that a practical pneumatic tire will be produced, having all the resiliency of the present type and none of its weak points. It will be non-puncturable, impossible to blow out, will run from 10,000 to 20,000 miles without attention; little or no rubber will enter into its construction, cost will be reduced at least

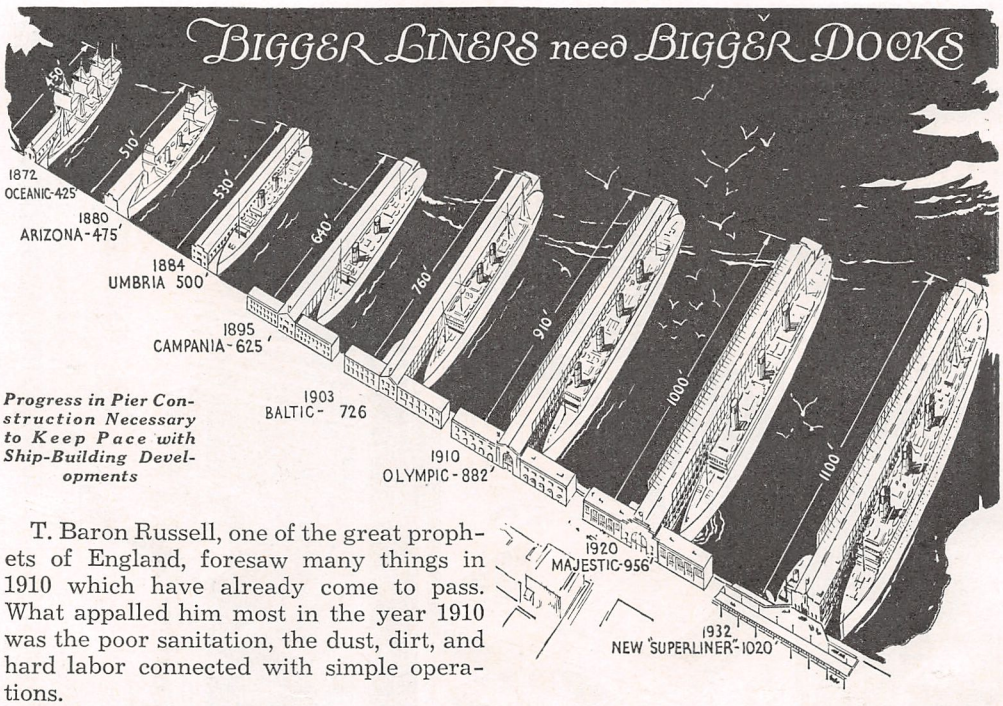


seventy-five per cent and repairs amount to little or nothing.

"The sale of pleasure vehicles will quadruple and the pleasure of motoring increase a hundredfold. The transmission as we know it today will be eliminated, and strong, efficient, durable motors will be produced, weighing less than two pounds to the delivered horsepower.

"Within the next twenty years (by 1930) it will be possible to buy a twenty-horsepower automobile for $500 that will last longer and give much better satisfaction than those sold today at from $2,000 to $4,000 each."

And American automobiles in the $500 class are rated today at more than twenty horsepower.



Progress in Pier Construction Necessary to Keep Pace with Ship-Building Developments

T. Baron Russell, one of the great prophets of England, foresaw many things in 1910 which have already come to pass. What appalled him most in the year 1910 was the poor sanitation, the dust, dirt, and hard labor connected with simple operations.

"The new age," he declared, "will be the clean age. Cooking will be a much less disgusting process than it is today. In no case will a domestic servant be called upon to stand over a roaring fire. . . .

"When radiation has been fully studied, it will almost certainly be found that the sun, which is the source of practically all terrestrial activity, has been showering upon us the rays that are capable of correcting every sort of disease germination. The value of sun baths, of exposing the body to sunlight, is already discussed in connection with anæmia, chlorosis, and the early stages of consumption."

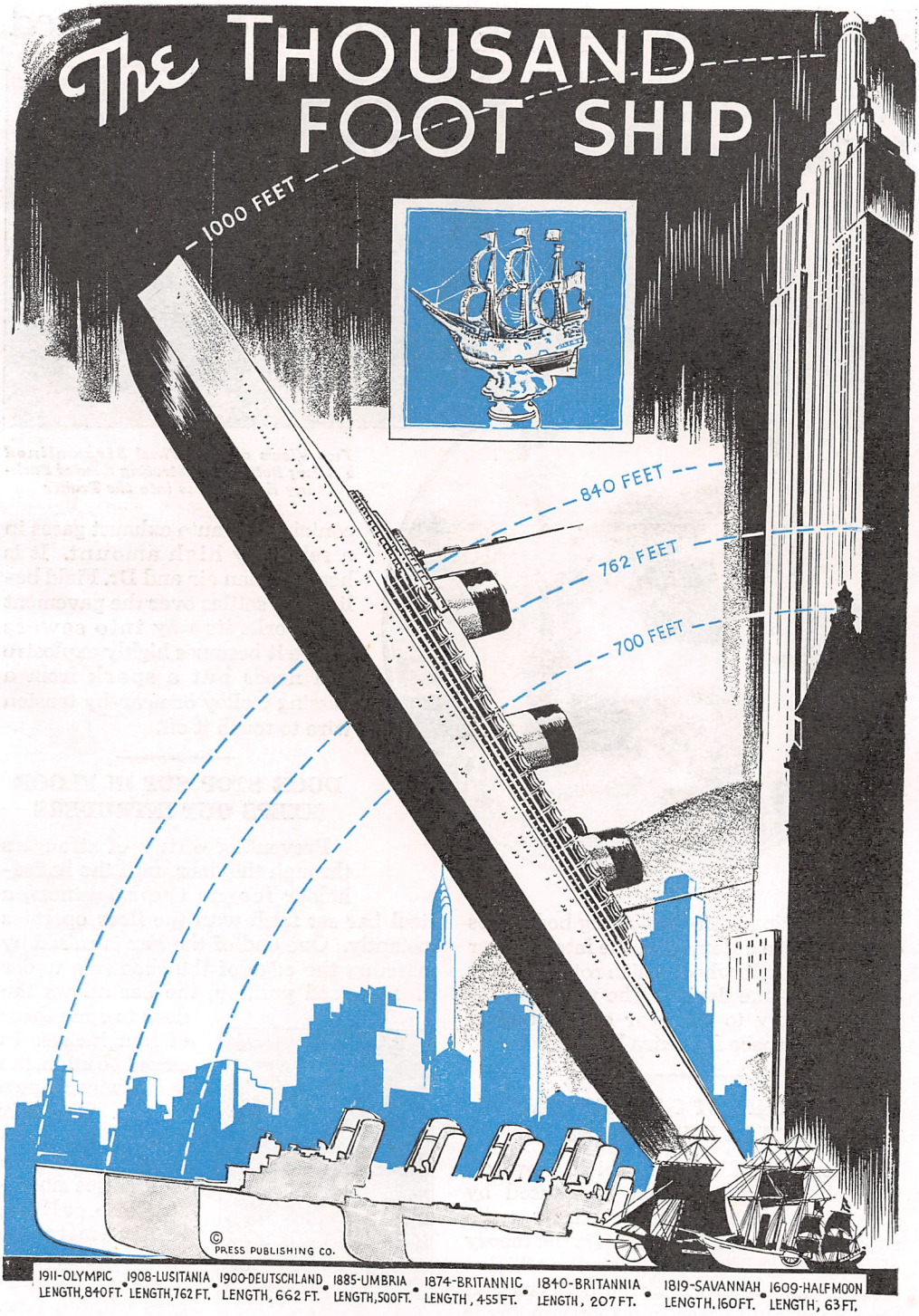
"The time has come," cried the famous inventor, Hudson Maxim, "to connect the city and the sky. The marvel of aviation has arrived in our time and it is destined to have a revolutionary effect in shaping the architecture of the future. We must make preparations to travel by the sky-road.

"Provision must be made for the housing of the vast number of airplanes that are destined soon to flock the morning and evening skies. The city will grow skyward to meet aviation. Roof gardens, roof playgrounds, roof hotels, connected with one another by enormous bridges and promenades will unite and lock the city together into one great unit, one enormous structure."

One of the most accurate prophecies made in the year 1910 concerned the coming of 1,000-foot ships to the shore of America. This, of course, will come true in the year 1935, one-quarter of a century after the prophecy was made.

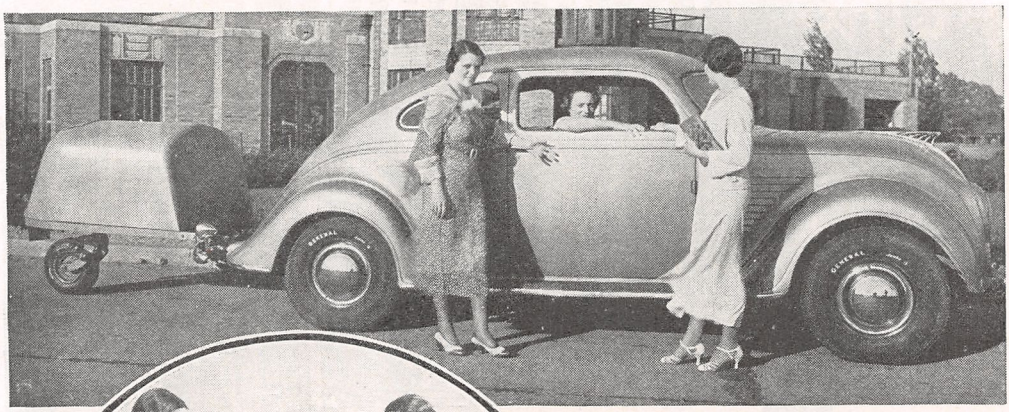
In 325 years the length of ships coming into the Hudson river will have increased from sixty-three feet, the "Half Moon" of Henrik Hudson, to 1,027 feet, the French superliner, "Normandie." The time of crossing will have decreased from fifty-nine days, or 1,416 hours, to four days, or ninety-six hours. In 1910, the "Olympic" and "Titanic" were under construction for the White Star Line. The "Titanic" subsequently went down in a great sea tragedy. The "Olympic" was then the greatest ship afloat, 840 feet in length, and capable of twenty-one knots. Were it not for the "Titanic" disaster, the 1,000-foot ship would undoubtedly have come much sooner than 1935.

These prophecies, which are now part of history, furnish us ample proof of how responsible predictions may parallel the course of human progress.



Growth of the Transatlantic Liner from the Sixty-Three-Foot "Half Moon" of 1609 to the 1,000-Foot Liner of 1935; What May the World Expect in Another 300 Years?

Trailer with a Single Wheel Is Streamlined



Two Views of One-Wheel Streamlined Trailer; Bottom, Illustrating Ease of Packing Extra Cases into the Trailer

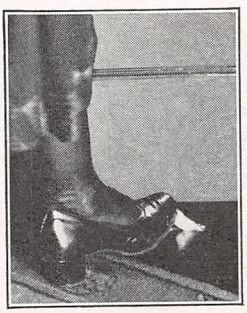
Harmonizing with the flowing body lines of the modern automobile, the latest trailer rides on a single wheel which rotates freely on a caster-like device. The trailer is attached rigidly to the rear of the towing car. It has space for extra luggage.

AUTO EXHAUST GAS MAY CAUSE SEWER EXPLOSIONS

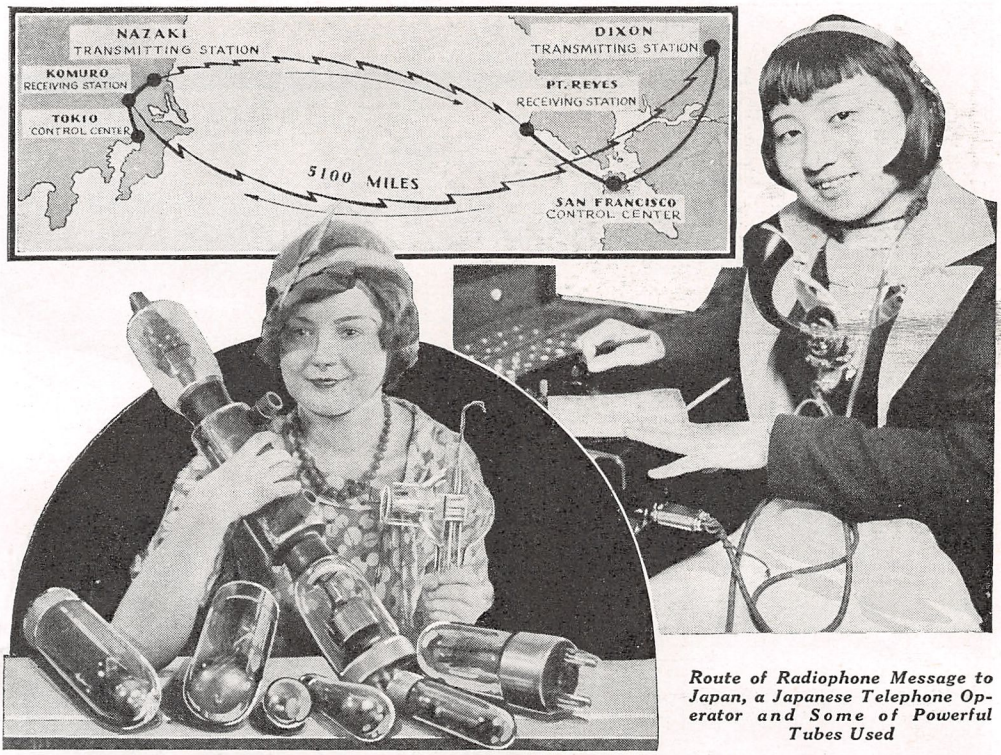
Explosions in sewers which blow off manhole covers may not be caused by sewer gas but by methane gas from the exhausts of automobiles. This is the theory of Dr. George W. Field, consultant biologist for the government who believes that seepage of auto gases into sewer mains is responsible for manhole explosions. Methane, known to miners as "fire damp," is contained in auto exhaust gases in a relatively high amount. It is heavier than air and Dr. Field believes it settles over the pavement and works its way into sewers where it becomes highly explosive and needs but a spark from a passing trolley or near-by tension wire to touch it off.

DOOR STOP SET IN FLOOR KEEPS OUT INTRUDERS

Preventing entry of strangers through the door until the householder learns their business, a steel bar set flush with the floor operates instantly. One end of the bar is raised by inserting the edge of the shoe sole under it. In raised position, the bar allows the door to open three or four inches. In closed position, the door swings open freely. The bar cannot be seen from the outside and causes no offense to callers, but permits the housewife to converse with strangers without fear. The door stop can be raised at night to afford additional protection against prowlers.



Trans-Pacific Radiophone Scrambles Calendar



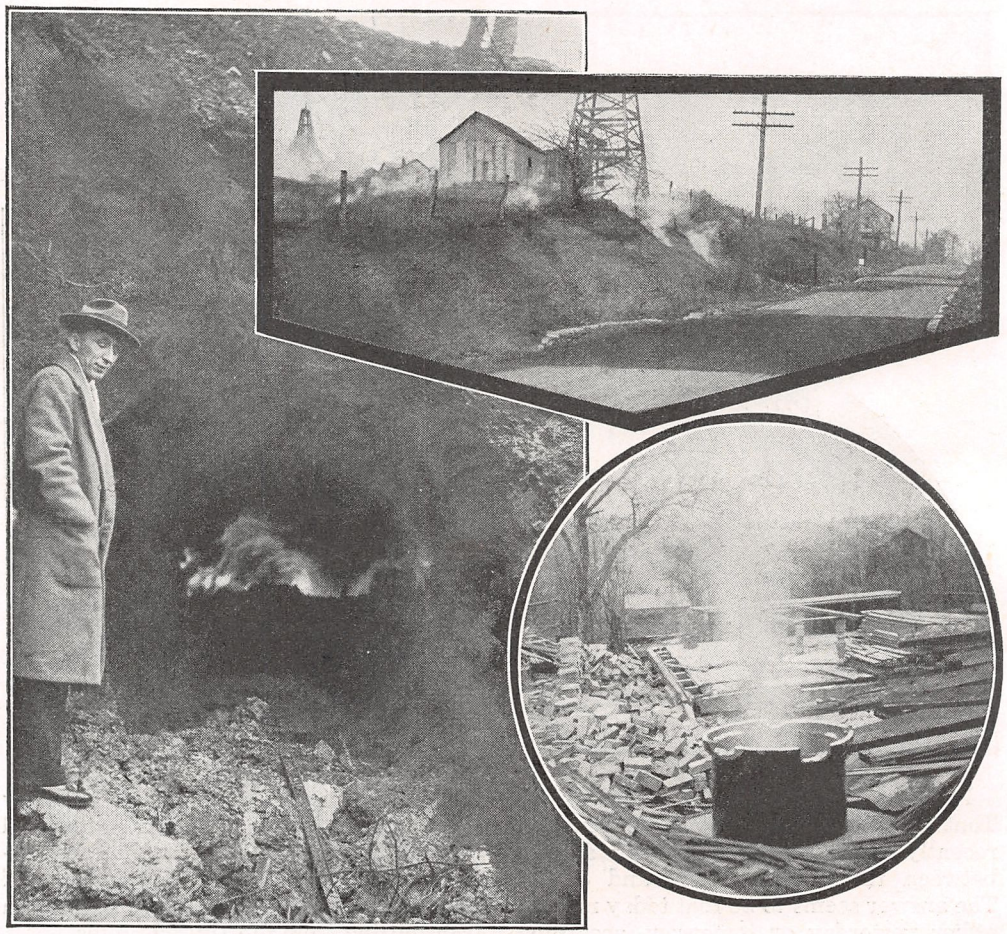
Route of Radiophone Message to Japan, a Japanese Telephone Operator and Some of Powerful Tubes Used

Is today yesterday or is it tomorrow? That is a question faced by those using the recently opened radio-telephone service between the United States and Japan. The answer seems to be that today may be either yesterday or tomorrow, according to where you happen to be when talking. The scrambled condition of the calendar is due to the fact that a message transmitted across the Pacific crosses the international date line en route. For instance, if you are in Tokyo and decide to call a friend in New York at six o'clock Sunday morning, you need not worry about disturbing his Sabbath snooze. For in New York it will be only four o'clock Saturday afternoon and your voice will actually be traveling from Sunday to Saturday. But your friend's voice will be traveling from today into tomorrow. From San Francisco messages bound for Tokyo travel by wire to the Dixon, Calif., transmitting station, then by radio across the Pacific to Komuro receiving station, hence by wire to Tokyo. From Tokyo the messages travel by wire to Nazaki transmitting station, then by wireless to Pt. Reyes receiving station and by wire to San Francisco. Eight tubes totaling 20,640 watts, including two tubes of 10,000 watts each, are among those used in transmitting from the United States.

TREE INSULATED BY ITS BARK IS RESISTANT TO FIRE

One of the curiosities of Colombia, South America, is the chaparro tree which is virtually fireproof since it can withstand the flames which often burn the grasses surrounding it. The reason is that the bark is arranged in loose layers so a considerable amount of air gets in between the bark and the wood. This air is a good insulator and a poor conductor of heat and the living tissues of the tree thus are protected from the flames. Only a short time after the passing of a fire, should the rainy season set in, this unusual tree may be sending out green leaves although its bark is charred.

Government to Attack Fifty-Year Mine Fire



A Coal Mine, a Highway and a Home Destroyed or Damaged When an Underground Fire in Ohio Reached the Surface; Note Smoke Issuing from What Was Once the Cistern of the Home

After burning steadily for fifty years and defying all man's efforts to extinguish it, a coal-mine fire near New Straitsville, Ohio, soon may become the object of an attack by the federal government. The fire was started in 1884 during a strike of coal miners when several loaded mine cars on a tipple were saturated with oil, ignited and run into the mine a mile under the hill. Now after half a century the fire has spread over six square miles, and several fortunes have been spent in trying to put it out. At one time the course of a creek was diverted into the mine. At another time cement walls were sunk into the earth in an effort to stop the flames. All known crevices were sealed and steam was forced into the labyrinths eaten away by the flames. All the efforts proved fruitless, the underground fire has continued to rage and now it is estimated that it has burned coal valued at $50,000,000 and threatens fuel worth $60,000,000 more. During the years the fire frequently has eaten its way to the surface, its fumes and heat killing forests while the territory under which it has burned is honeycombed with caves, crevices and great cracks. For a time an $80,000 high school was threatened by the flames under the ground and several farm homes were abandoned when the flames caused the foundations to sink. One farmer awakened one morning to find his cistern spouting fire. The flames had

eaten their way to it and the cistern itself acted as a smokestack. The fire also caused a paved road to sink in several places, has threatened oil wells and has caused other small mines to be abandoned when it broke through into them. Recently the government sent investigators to the scene to map out a program for extinguishing the fire. This attempt, if made, probably will be a Public Works Administration project costing about $500,000 and entailing the employment of about 500 men.

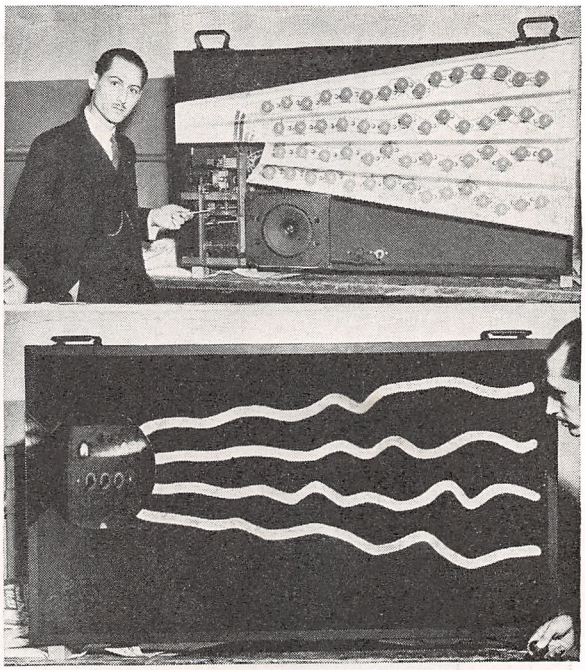
SUNLIGHT USED TO DRIVE SMALL MOTOR

Solar radiations are converted into mechanical motion by a sunshine motor demonstrated recently. Constructed by Dr. M. C. W. Hewlett of General Electric laboratory, the motor requires about 100 micro-watts of energy. This energy is supplied by several Hewlett photo-cells which convert sunlight into electrical energy.

Small Motor at Left Is Driven by Energy Taken from Sunlight by Photo-Electric Cells

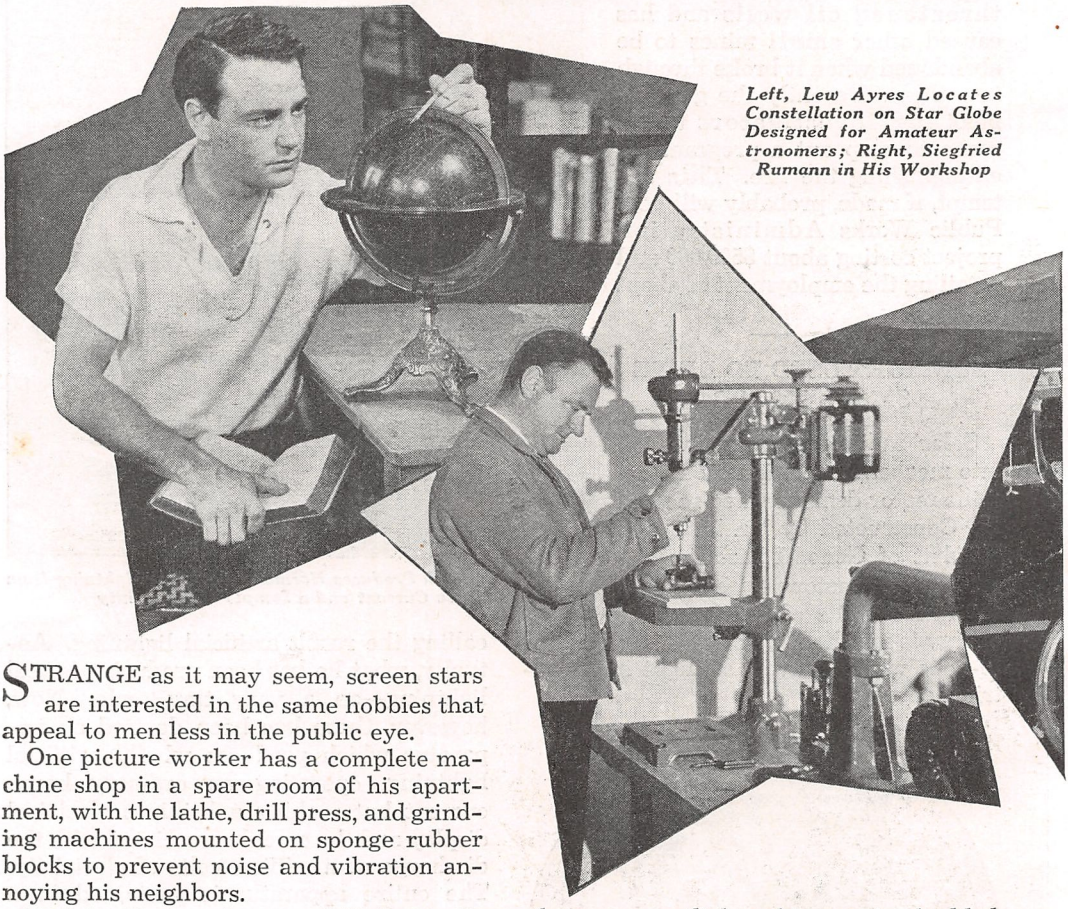
LIGHTNING-MAKER OPERATES ON HOUSE CURRENT

For a long time man has been producing powerful electrical discharges and calling the result artificial lightning. Actually, what he has been producing is real lightning—on a very tiny scale. Now, however, there has been devised an apparatus which produces wholly artificial lightning, operating on ordinary house current but making a brilliant electrical display and the crackle associated with the discharge of a million volts of electricity. The entire apparatus is contained in a portable case weighing only 120 pounds. There are four troughs of ten-watt clear lamps treated by dipping them in a blue coloring solution to give an even distribution of light without accentuating the bright spots produced by the lights themselves. A small motor, through a gear reducer, drives a bank of cams and notches on the cams cause rapid flashes of the four banks of lights. Interruption of the current is utilized to simulate the sound of high-voltage discharge by coupling through condensers and resistors to a speaker having a powerful permanent magnetic field, thus requiring no field exciting current. Thus, a small spark, barely audible, is amplified to ear-splitting intensity. A screen with jagged slits covers the lamp troughs and indicates the path of "high voltage."



Apparatus Which Produces Harmless Artificial Lightning from House Current and a Sample of Its Ability

HOBBIES *of the*



Left, Lew Ayres Locates Constellation on Star Globe Designed for Amateur Astronomers; Right, Siegfried Rumann in His Workshop

STRANGE as it may seem, screen stars are interested in the same hobbies that appeal to men less in the public eye.

One picture worker has a complete machine shop in a spare room of his apartment, with the lathe, drill press, and grinding machines mounted on sponge rubber blocks to prevent noise and vibration annoying his neighbors.

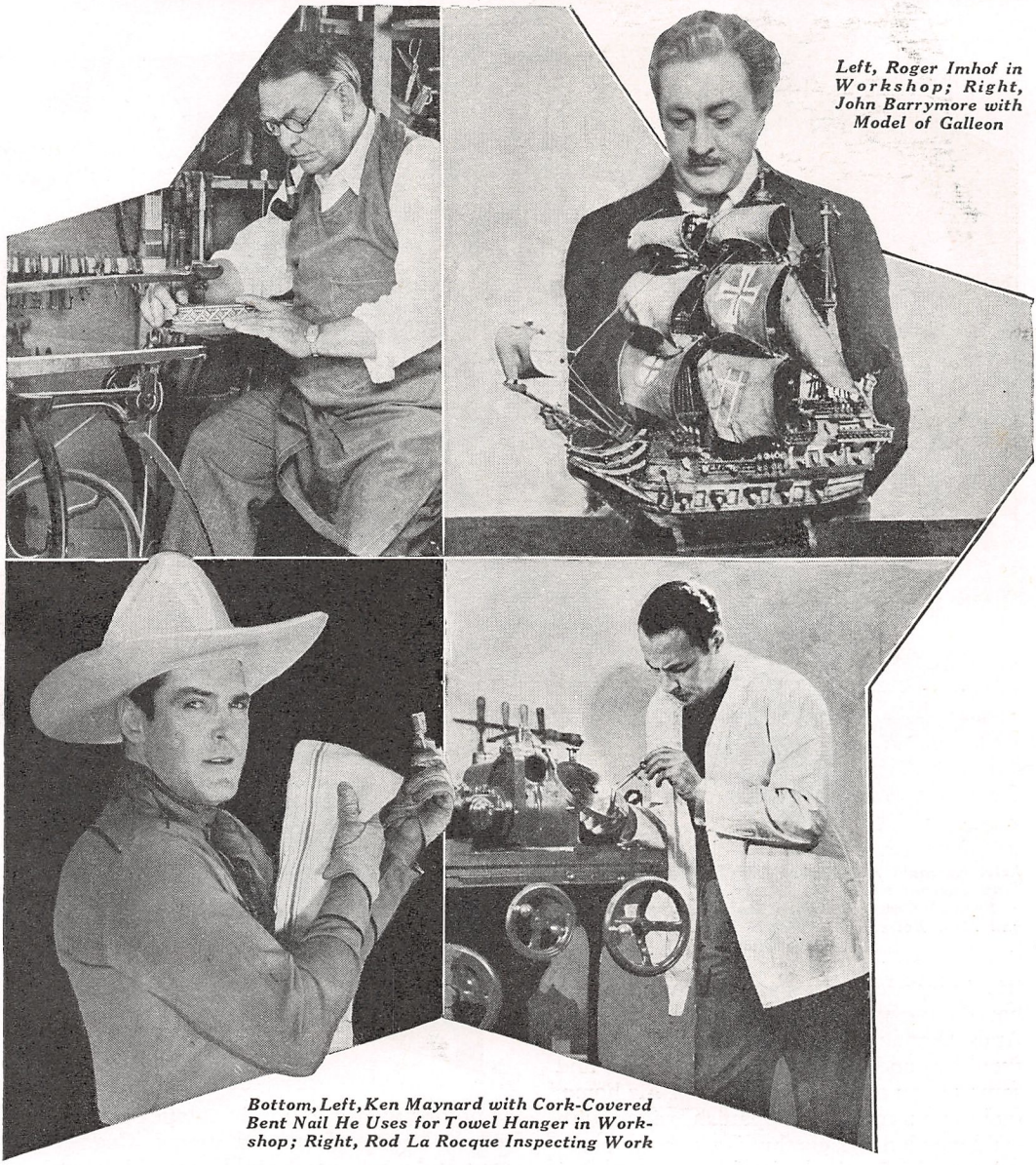
Rod La Rocque is one of Hollywood's most versatile craftsmen. Skilled mechanic and woodworker, he also is an artist at photography and an expert model builder. His two-story garage is almost entirely filled with equipment. La Rocque has applied for patents on numerous inventions, among them being an improved type of lens shade for cameras, a new kind of dry cell, and a self-fluorescing screen that, after exposure to the sunlight, illuminates a darkened room.

A revolver-searchlight that enables a marksman to fire in the dark without using his sights was originated by Warner Baxter, co-inventor with Albert B. Scott, firearms expert. The device throws a narrow ray in the shape of a tiny cross from a tube alongside the gun barrel. Unlike other gun spotlights this one is shielded so that unless it is focused directly on a criminal's eyes, he cannot find the source of the ray.

Perfected by Alan Hale, veteran screen actor, a sliding theater chair allows spectators to push their seats backward instead of rising when late comers arrive. Hale has developed a fruit-jar lid that automatically seals itself, and a new type of "hi-brow" spectacles that gives a clear, unobstructed view in all directions. Just now, with the help of two engineers in his private laboratory, he is improving a new internal-expanding automobile brake. The first set, installed on his own car, has given efficient service for more than 70,000 miles.

Hollywood hobbies range from the magic tricks with which Lyle Talbot entertains

HOLLYWOOD STARS



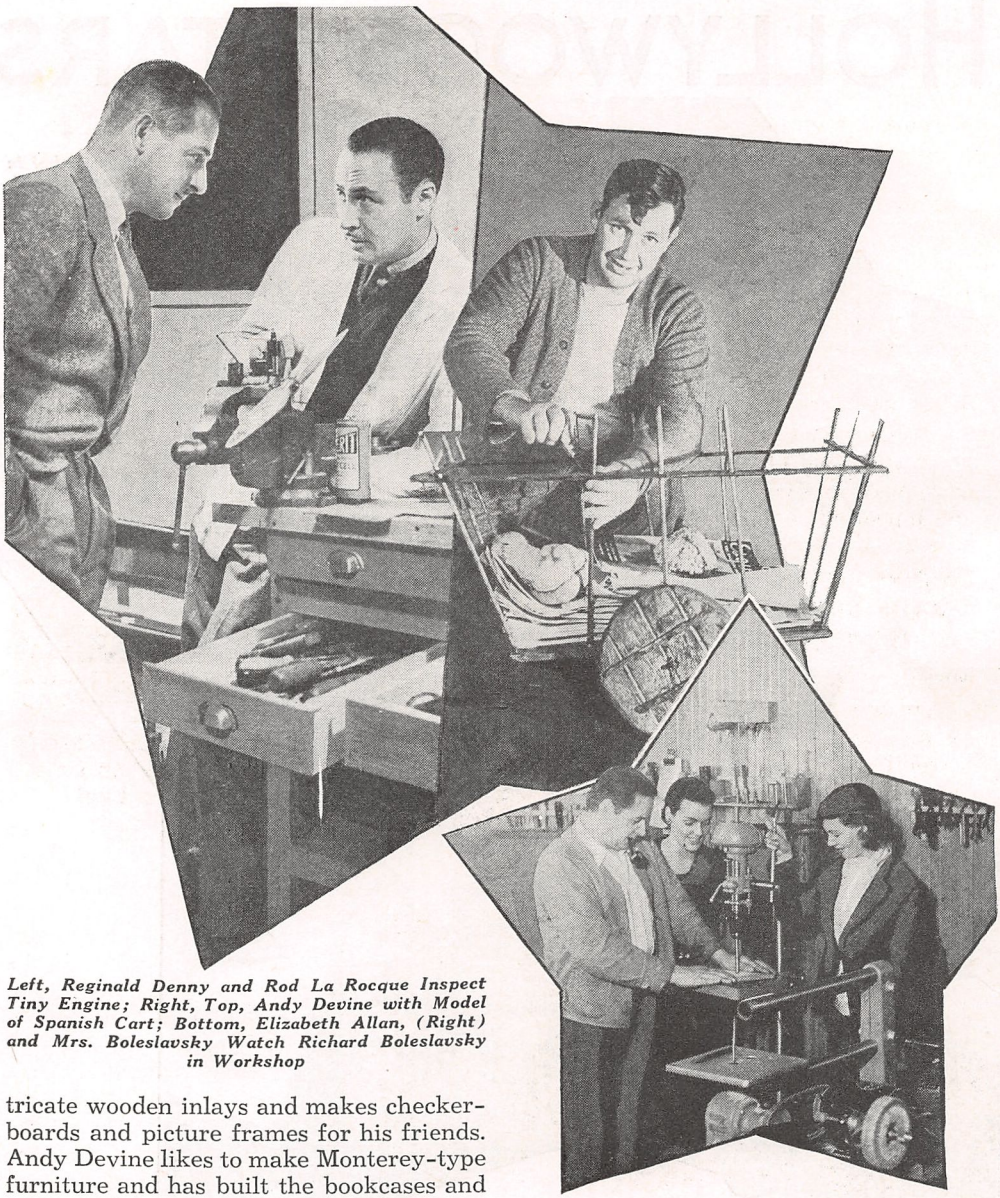
Left, Roger Imhof in Workshop; Right, John Barrymore with Model of Galleon

Bottom, Left, Ken Maynard with Cork-Covered Bent Nail He Uses for Towel Hanger in Workshop; Right, Rod La Rocque Inspecting Work

friends to the serious bacteriological studies of Siegfried Rumann, who has a complete research laboratory in his home.

One of the most popular pursuits is model making and wood carving, with Reginald Denny regarded as one of screenland's best builders of model yachts and airplanes. Denny builds most of his models at home but when he has an especially intricate piece of construction he goes to Rod La Rocque's house to use his equipment. John Barrymore builds models of old galleons in his spare time, and Henry Wadsworth and Jackie Cooper construct miniature airplanes.

Roger Imhof, feature player, carves in-



Left, Reginald Denny and Rod La Rocque Inspect Tiny Engine; Right, Top, Andy Devine with Model of Spanish Cart; Bottom, Elizabeth Allan, (Right) and Mrs. Boleslavsky Watch Richard Boleslavsky in Workshop

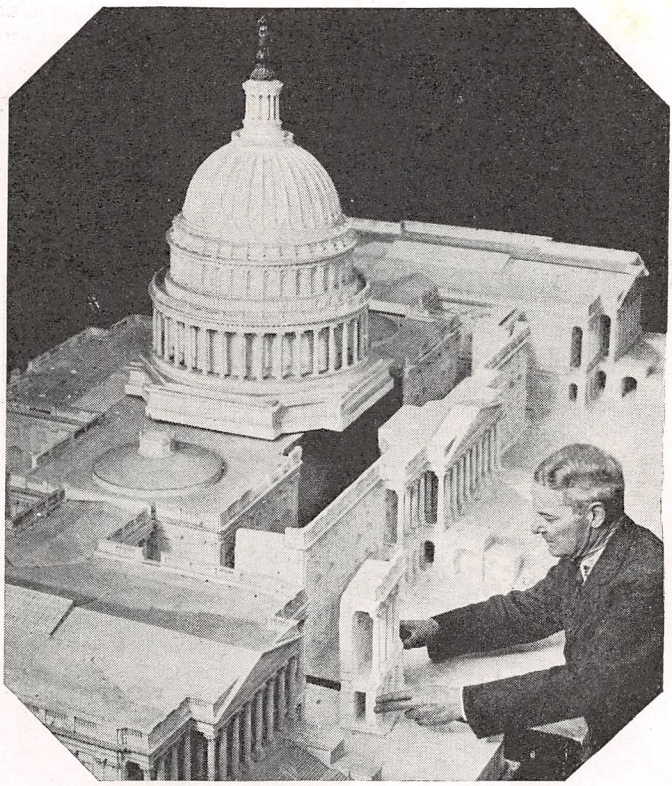
tricate wooden inlays and makes checkerboards and picture frames for his friends. Andy Devine likes to make Monterey-type furniture and has built the bookcases and some of the other furnishings of his home, including a miniature Spanish wagon with solid wooden wheels that is used as a magazine rack. Devine's chief tool is a pocket knife. Robert Armstrong, who also makes furniture on the days he is not at the studio, has a well equipped carpenter shop in his Mexican-type farmhouse home. Arthur Hohl, character actor, makes old-fashioned oak furniture and Edward Everett Horton spends part of his time in his wood-working shop at home. Lewis Stone is another whose hobby is cabinetmaking. Robert Montgomery and James Cagney carve and work wood, and Henry Wilcoxon makes wood cuts.

As a diversion from painting pictures, writing books, and directing screen plays, Richard Boleslavsky fashions candlestick holders and flower vases out of bronze. Ivan Simpson, character actor, has won renown for the wrought-iron ornaments

(Continued to page 118A)

Face Lifting for Capitol to Center Dome

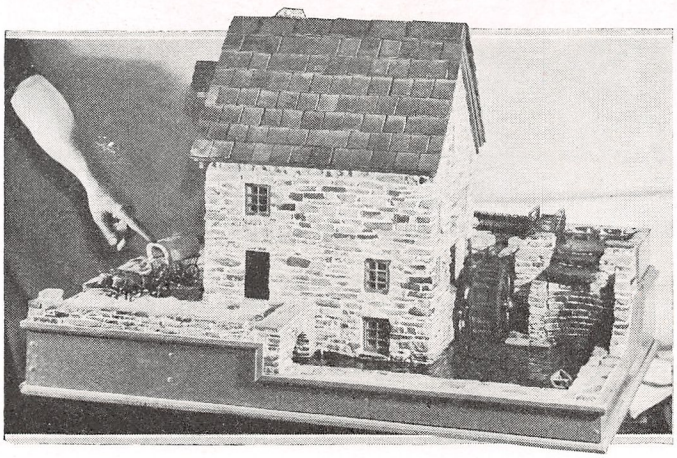
One of the next proposed projects of work on government buildings in Washington involves remodeling the east face of the capitol. In planning the remodeling, a model of the building has been constructed to aid architects. The changes would extend the center portion of the building, between the senate and house wings, forty feet and thus correct an optical illusion which now makes the dome appear off center.



Model of Capitol Used in Planning Changes to Correct Optical Illusion Which Now Makes the Dome Appear Somewhat Off Center

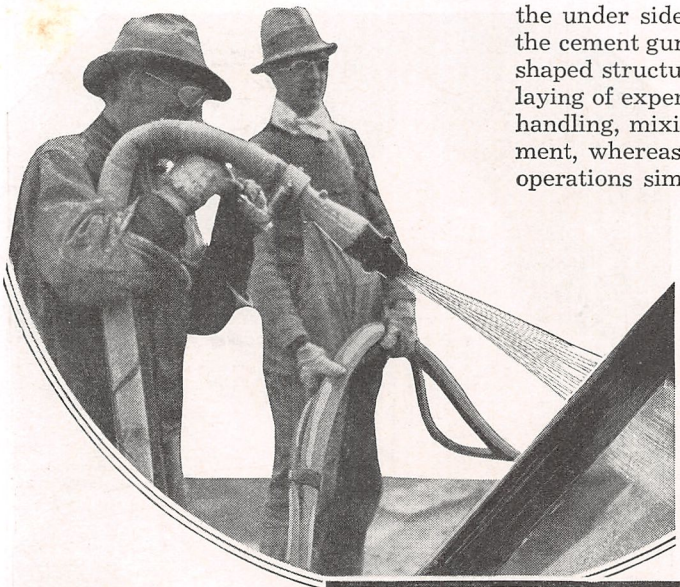
MODEL OF MILL MADE OF TINY CUT STONES

Miniature cut stones, of the style and shape of the original, were used in constructing a model of an old flour or grist mill. Regular mortar holds the stones together. The model has three stories, with a roadway to the main entrance and a ramp in the rear. The water wheel is made of wood and metal, its lower blades immersed in a pool of water that disappears through an arch under the roadway. The stream that turns the wheel is at a higher level at the rear of the model, excess water passing below a wooden foot bridge and overflowing into the pool at the right of the wheel. A watertight box forms the base of the model. A wagon, pulled by oxen and resembling the freight wagons used in the middle of the nineteenth century, is a part of the model. The wagon, of the old covered type, is in position to receive a load of flour. The mill is a reproduction of a mill that did a flourishing business back in 1842.

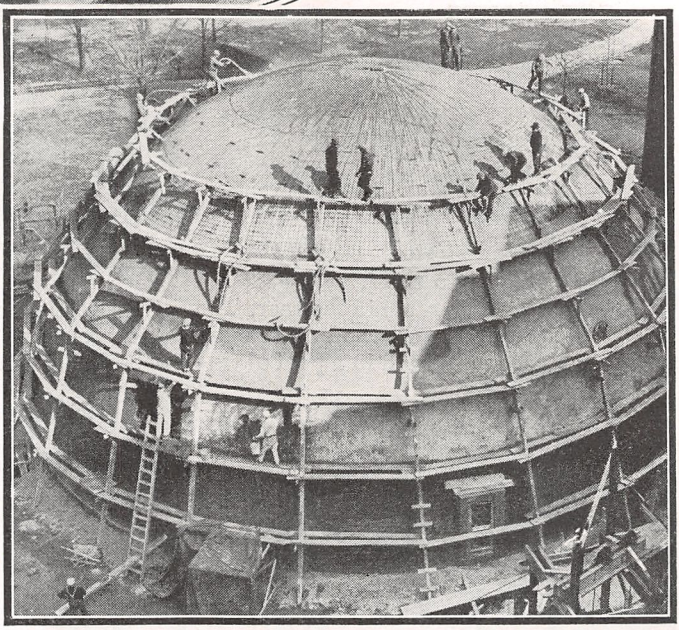


Miniature Reproduction of Historic Mill; Note Tiny Wagon Closely Resembling the Freight Vehicles of That Day

Planetarium Dome Formed by Cement Gun



Workmen Spraying Cement on Dome and View of Partly Completed Planetarium



To eliminate the need for an expensive set of forms and molds, a cement gun was used to form the dome of the Hayden planetarium of the American Museum of Natural History. The dome is self-supporting, and aside from the steel webbing in the concrete, contains no structural steel or supports. Instead of using forms, it was built by being shot out of a gun. Over a temporary dome-shaped backing, wire webbing was laid. Dry sand and cement then were pumped through a hose connected to the mixing nozzle of a spray gun which was connected to another hose through which water was pumped. The pressure changed the mixture into concrete which then was shot out of the gun at high speed and sprayed over the dome until the required thickness was obtained. The dome thus is one solid mass of concrete, a cork lining being placed on the under side to soundproof it. Without the cement gun, the erection of this dome-shaped structure would have required the laying of expensive forms and the separate handling, mixing and spreading of the cement, whereas the gun performs all these operations simultaneously.

COAL DUST IS USED AS MOTOR FUEL

Experiments with a motor intended to burn coal dust as fuel are being conducted in Germany. One of the difficulties encountered has been the abnormal wear to which all moving parts are subjected, but this problem has been partly solved by using special alloy metals. The coal-dust motor is able to burn any combustible dust. The coal used is treated to reduce ash content and is ground very fine to permit better combustion and a low ash residue. Germany produces coal but must import mineral-oil fuels and the coal-dust motor therefore is important from an economic standpoint.

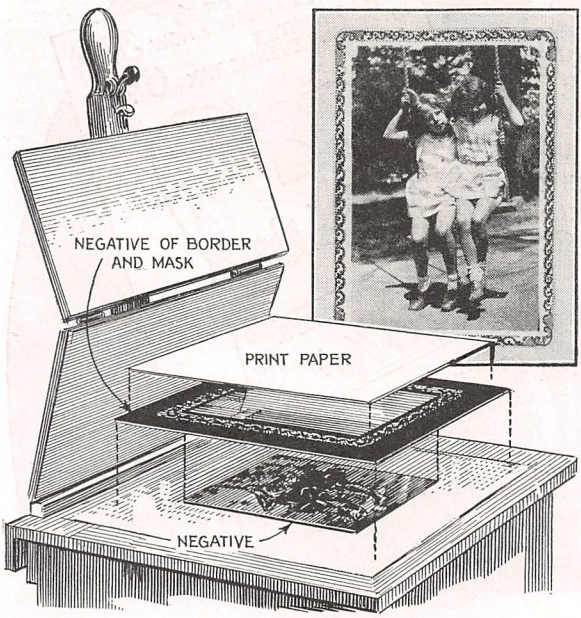
Latest Weapons Used by U. S. in Crime War

For combating crime, the latest weapons have been placed at the disposal of agents of the United States department of justice. This action is one of the government's steps in adequately equipping its agents to battle the gangster, kidnaper and other types of criminal. Among the new weapons is a tear-gas gun that has been found highly efficient in routing the criminal from his hiding place. Another addition to the federal armament is a Colt monitor, which fires a thirty-caliber bullet accurately up to four miles.

Examining Some New Weapons That Federal Agents Will Use in Nation-Wide Campaign against the Criminal

BORDER MASK IS PRINTED WITH THE NEGATIVE

Fancy borders and negatives can be printed at the same time by using a new border mask that makes the old double operation unnecessary. Formerly, the border of the photograph was printed first, the mask removed from the printing frame and then the negative and paper were slipped into place. The new border mask has six different colors that take care of the difference in the densities of negatives, thus producing a border and photographic print of the same color. This makes it possible for the camera fan to print his own borders on his pictures without trouble. The borders are made up in artistic and modernistic designs with nameplate if desired.



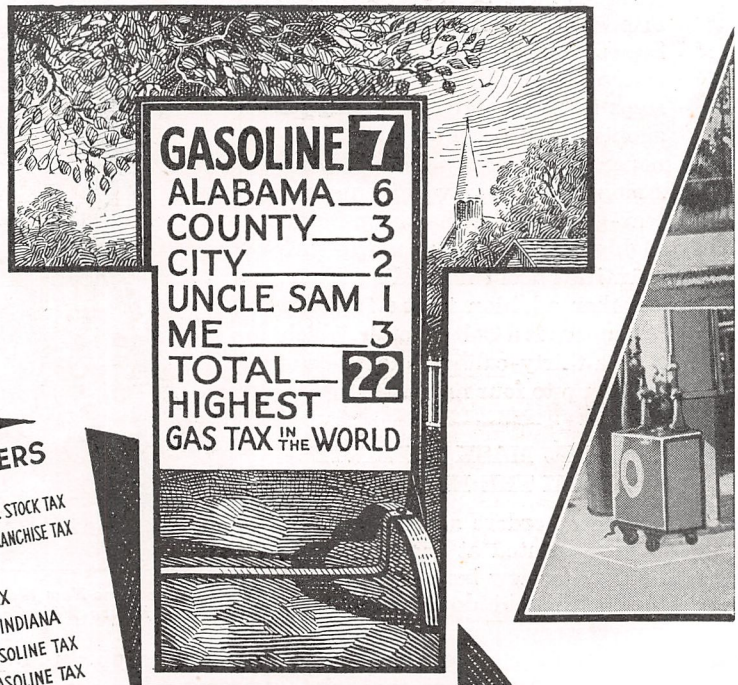
Drawing of Negative and Border Mask Being Printed at Same Time; Upper Right, the Finished Product

FRUIT JUICES PRESERVED BY SILVER PROCESS

Apple cider, grape juice and other fruit juices can be kept from spoiling by a combination of silver and electricity that kills bacteria. Silver in minute quantities is added to the fruit juice and a small electrical current is passed through the solution. The electricity forces the silver into solution, preventing fermentation. The process is similar to the bacterial sterilization of water by the use of colloidal silver.

WHO PAYS *the*

Right, Sign Posted by an Alabama Filling Station Proprietor to Show Why He Sold Gasoline for Twenty-Two Cents a Gallon; He Paid Seven Cents for a Gallon of Fuel and the "Me" Represents His Profit of Three Cents; the Other Twelve Cents Paid by the Consumer Was Taxes; Below, Story of Taxes Collected from the Manufacturer of a Nationally Distributed Product



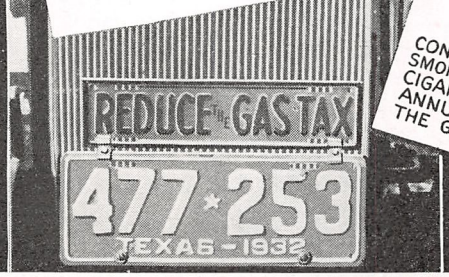
TAXES PAID BY SMITH BROTHERS

FEDERAL INCOME TAX
FEDERAL CAPITAL STOCK TAX
FEDERAL EXCESS PROFITS TAX
NEW YORK STATE FRANCHISE TAX
CITY TAX
CITY TAX
COUNTY TAX
COUNTY TAX
STATE TAX - NEW YORK
STATE TAX - INDIANA
AUTOMOBILE LICENSE TAXES
FEDERAL GASOLINE TAX
FEDERAL OIL TAX
NEW YORK GASOLINE TAX
TELEPHONE TAX
TELEGRAPH TAX
CHECK TAX
TAX FOR CODE ADMINISTRATION
PROCESSING TAXES ON SUGAR-WHEAT-CORN-PORK-COTTON-PEANUTS
STATE OF INDIANA FOREIGN CORPORATION REGISTRATION
STATE OF INDIANA TAX ON GROSS RECEIPTS
STATE OF OREGON TAX ON GROSS RECEIPTS
STATE OF WASHINGTON TAX ON GROSS RECEIPTS
STATE OF CALIFORNIA PERSONAL PROPERTY TAX
STATE OF WASHINGTON PERSONAL PROPERTY TAX
STATE OF OREGON PERSONAL PROPERTY TAX

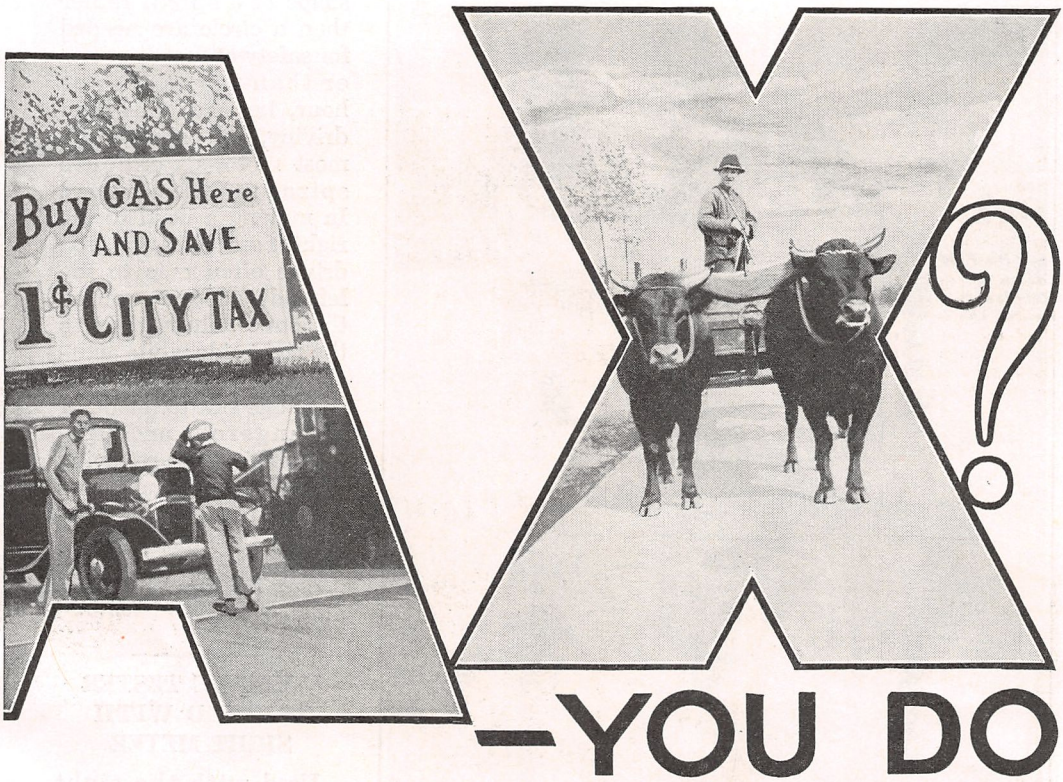
We do Our Part...

FACTORY PRICE OF 20 LEADING CIGARETTES NOW 3 7/10¢
UNITED STATES INTERNAL REVENUE TAX 6¢

CONSUMER SMOKING A PACKAGE OF 20 CIGARETTES A DAY PAYS AN ANNUAL TAX TO THE GOVERNMENT OF $21.90



Sign Displayed by Motorist Who Favors Reduction of Tax on Gasoline, and the Factory Price of a Package of Cigarettes Compared with the Federal Tax Assessed against the Package



Motorist Buying Gas Outside Town Limits to Escape City Tax and an Ox Team Traveling on a Concrete Highway Which Was Paid for by a Tax on Gasoline

IF the head of every family in the United States was compelled to work for the government three months out of each year without pay before he could start earning a living for his dependents, he would probably be willing to compromise on a less costly government in return for a bit less of his labor. Yet that is exactly what is happening in the United States today.

The income of the average family of 4.2 persons is $1,184. The average tax bill—local, state and federal—is $300 a family—more than a quarter of the annual income. In addition, each family is saddled with a debt of $1,800, which must be paid through additional taxation as the government bonds fall due.

It is the prevailing idea among the majority, who are exempt from the income tax and who own no real estate, that only the wealthy pay taxes. In reality even the poorest person pays tribute to the government with even his smallest purchase.

Bread begins to be taxed when the farmer pays the county tax collector. The processing tax then raises the price of wheat thirty cents a bushel, or about half a cent on a loaf of bread. Then the miller and baker must pay real estate and income taxes, and must pay their employes larger wages because they too are taxed. These taxes, amounting to about two cents a loaf, are all included in the cost of production and are paid by the person who buys the bread. With the government slaughtering little pigs and the packer paying a processing tax of $2.25 a live hundredweight, the consumer pays about four cents a pound in taxes when he buys pork chops. It is conservatively estimated that out of every dollar spent by the housewife at the grocer and butcher, nineteen cents goes to the tax collector.

Clothing is not taxed so highly, yet at least two dollars out of every hundred go to run the government. We pay two cents tax on every 1,000 matches, two per cent

(Continued to page 128A)

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Two-Passenger Model of the River Boat, "Robert E. Lee," Which Is Propelled by a One-Horsepower Motor

MODEL OF FAMOUS RIVER BOAT IS PROPELLED BY MOTOR

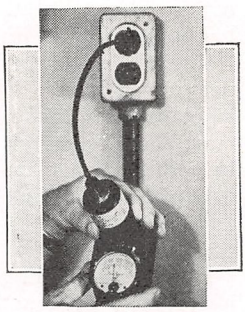
After constructing a model of the famous river boat, "Robert E. Lee," large enough to carry two passengers, the builder decided to motorize the craft. It is propelled by a one horsepower motor and attracts much attention as it chugs along a river with its capacity load of two persons.

"SANDPAPER" ROAD DECREASES SKIDDING ACCIDENTS

Accidents due to skidding by automobiles can be decreased by building "sandpaper" roads. This is the opinion of Prof. R. A. Moyer, of Iowa State College, who made an exhaustive study of skidding characteristics of tires on various types of road surfaces and decided the most important anti-skidding factor on a highway is to give the road a sandpaper-like finish with gritty particles. Bends taking the shape of a spiral rather than a circle are needed for safety at speeds greater than fifty miles per hour, he said. In actual driving, he pointed out, most motorists execute spiral transition curves. In making a bend to the right, for instance, the driver often cuts to the left side before entering the curve, then goes to the right side while actually in it. This wandering from one side to the other is dangerous and highway engineers are giving thought to building curves in spiral fashion so drivers can take them as they do now, but with greater safety to approaching motorists.

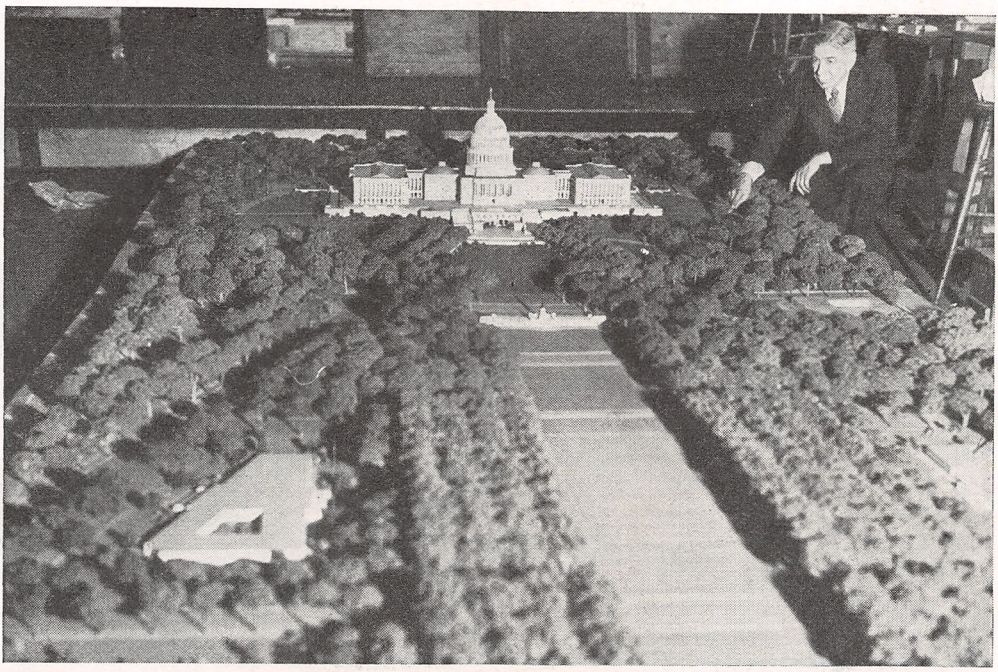
VOLTAGE TESTER IS USED WITH SIGHT METER

Used with the sight meter, a new indicator checks the socket voltage of a lighting system by turning volts into light foot-candles. The indicator uses a carbon-filament lamp, housed in a tubular container, with a plug-in cord. After the tester is connected, the end of the container is placed over the photronic cell or window of the sight meter, which then shows the intensity of the light in foot-candles on its dial. By using a conversion scale imprinted on the side of the container, the voltage of the lighting system can be determined quickly.



¶Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

Model of Washington Helps Plan Changes



Model of Section of Washington Near the Capitol Used in Working Out Proposed Changes Before They Are Attempted; the Grant Memorial Is Shown in the Foreground

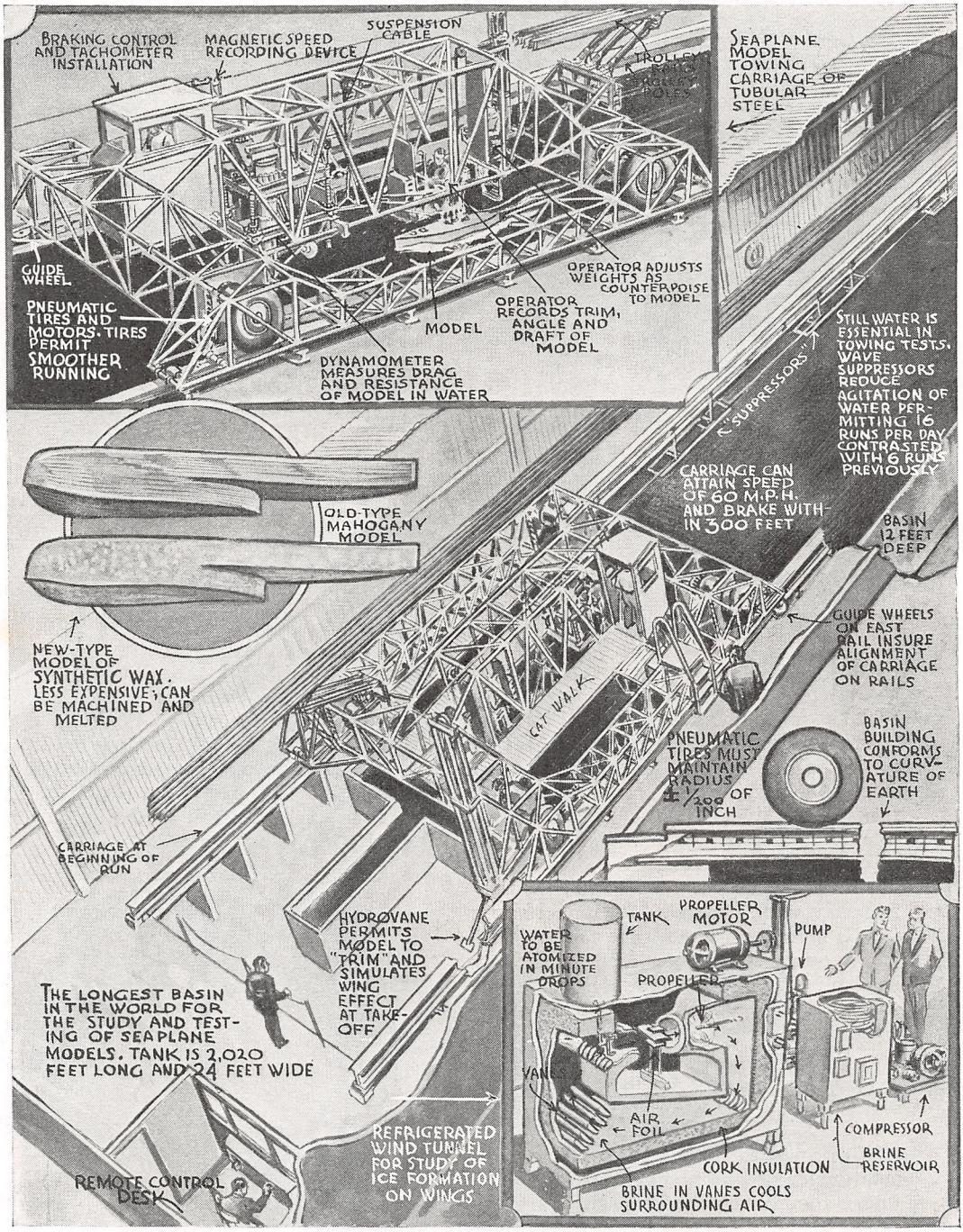
Changes being planned in the national capital first are worked out on a large scale model by officials of the national park planning commission in order to ascertain just how the proposed alterations will fit into the general plan for making the city more attractive. In the accompanying photograph is shown a model of Union Square, now being created at the east end of the Mall where the Botanic Gardens formerly were located. The model shows the Grant Memorial with the capitol in the background. At the north side of the new square is the Meade Memorial and at the south side a new memorial is to be erected. Its subject is not yet selected.

OUTFIT MAKES MICRO-PHOTOS AS EASILY AS SNAPSHOTS

With an outfit now on the market, the amateur can make photographs of objects under the microscope as easily as snapshots. The outfit consists of a camera, focusing tube, base, clamp and light-tight connector. Any make of microscope can be clamped to the base. The focusing tube, at the side of the camera, is rested on the eyepiece of the microscope, which is manipulated until the image is sharp and clear. Then the camera is swung over the eyepiece and the exposure made. Roll film No. 127, is used. The picture will be as sharp and rich in detail as the quality of the microscope will permit.

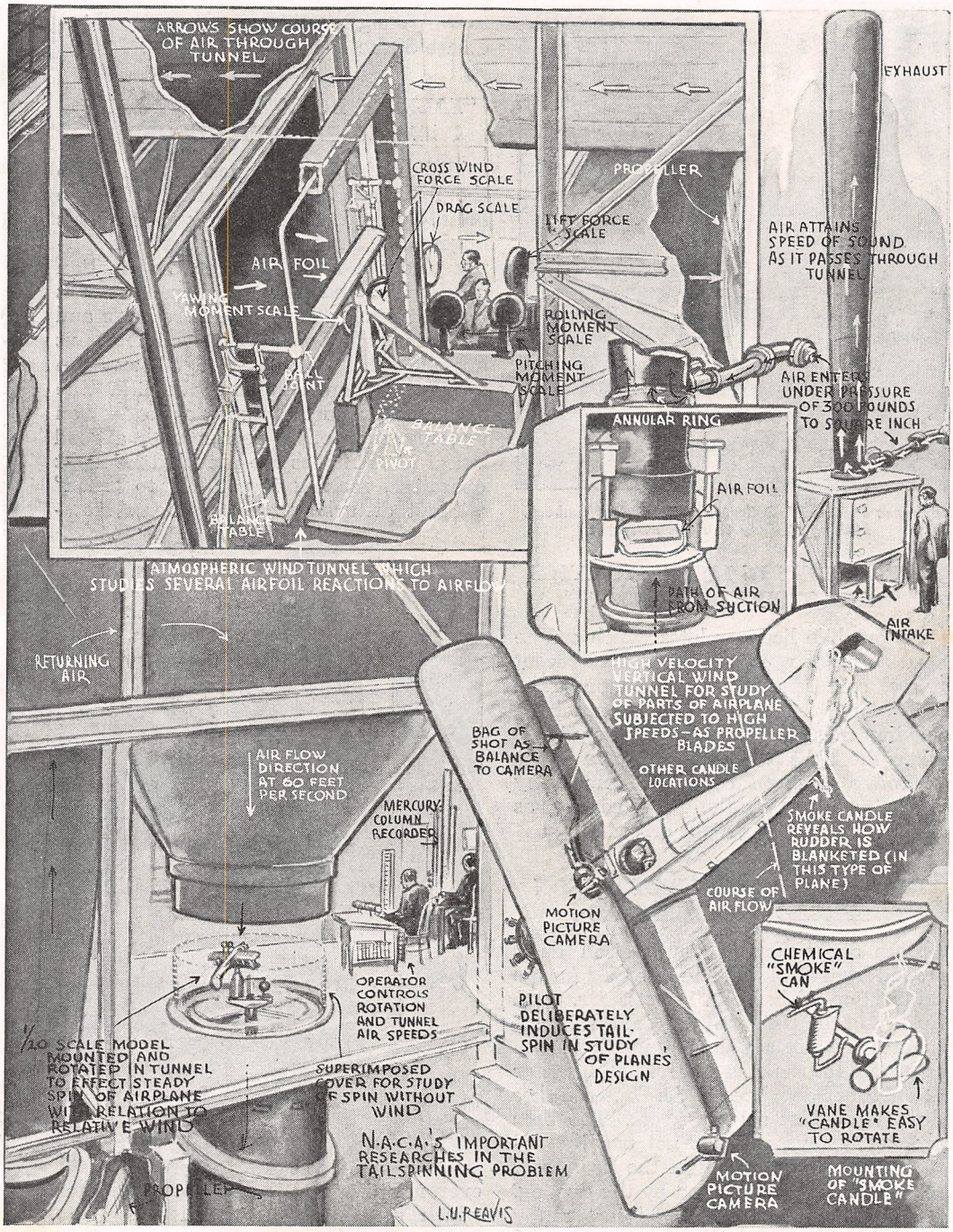
Equipment for Photographing Objects under Microscope; Its Operation Is Simple

Seaplane Models Proved in Half-Mile Tank



Here Are Some Aspects of the Work of the Langley Memorial Research Laboratories of the National Advisory Committee on Aeronautics in Promoting Safer, Speedier, Better Constructed and More Efficient Airplanes and Seaplanes; the Performance of Many of the Most Outstanding of Modern American Planes Can Be Traced Directly to Research Such as This

High-Speed Wind Tunnel Tests Plane Designs



Seaplane Models Are Tested by Suspending Them from an Overhead Carriage in a Tank More Than 2,000 Feet Long; the Carriage Can Attain a Speed of Sixty Miles per Hour; High-Velocity Wind Tunnels Quickly Demonstrate the Efficiency of New Plane Designs and Also Aid in Studying the Properties of Individual Parts of a Plane, Such as the Propeller Blades

License Plate with Reflectors Set in the Numbers, Making It Easy to Read at Night

REFLECTORS IN LICENSE PLATES ARE VISIBLE AT NIGHT

Automobile license plates which can be read at night were exhibited at a recent crime conference in Washington. The plates have reflectors set in the numbers, making the numbers themselves visible when the light from the car's own lamps or from a passing car falls on them. They are being urged for the entire country as an aid in identifying night drivers.

BEES KILLED BY INSECT POISON SPREAD BY AIRPLANES

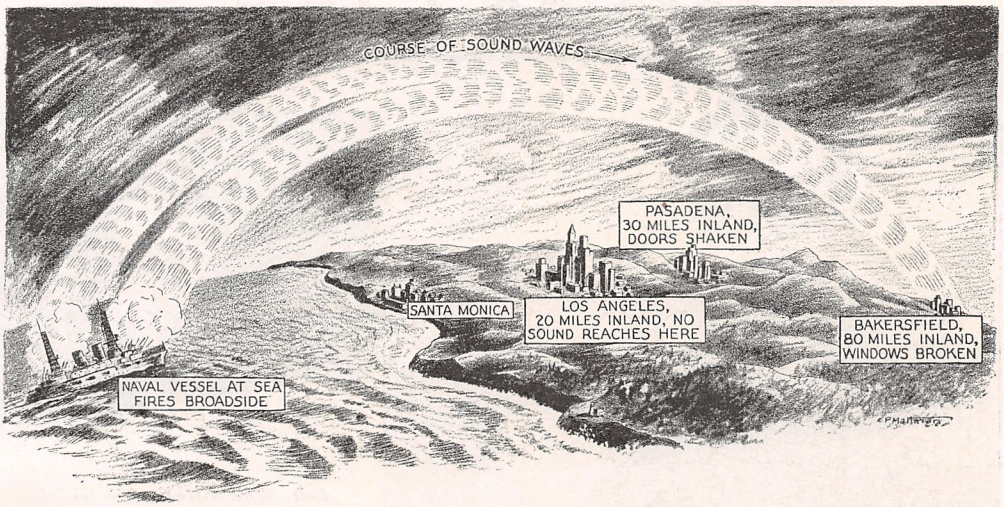
Bees are suffering from poison dusts spread from airplanes and intended for the destruction of harmful insects. Dr. J. E. Eckert, of the University of California, estimates the airplane dusting method is responsible for the loss of a million hives or colonies of honeybees in the United States during the past several years. The bees are not always, perhaps not usually, affected by the poisoning of the flowers of the plants being protected by the dusting. Apparently they are injured instead by the drift of part of the deadly dust into the flowers where they are working. Bees gathering nectar are usually killed by the poison before they can reach the hive, it has been found. Pollen-gathering bees carry home the poisoned food and give it to the young bees, thus cutting off the increase of the colony at its source.

"TALKING BOOK" FOR THE BLIND IN PHONOGRAPH RECORDS

"Talking book" machines, which read to the listener, have been devised for the blind. Instead of reading by running his fingers over Braille type, the operator simply places a record on the combination phonograph and radio receiver and turns on the switch. The records are large and the grooves fine, making it possible to put a whole chapter of the average book or an act of a play on one side of the disk. The records reproduce the book as read by an announcer or other person with a good voice. Headphones are provided for night operation, making it possible to "read" without disturbing the neighbors. However, normal operation is by loud-speaker, which serves phonograph and radio. Standard works of literature already have been transferred to records for use with the machine.

Blind Person Being Taught to Operate Machine That Reads through Medium of Records

Sound Waves from Big Guns Travel in Arc



Drawing Showing Path of Sound Waves from Big Naval Guns Which Broke Windows Eighty Miles Inland but Did No Damage in Cities Much Nearer the Coast

During naval target practice in the Pacific near Santa Monica, Calif., windows were broken by the sound waves in Bakersfield, eighty miles inland. On the other hand, no sound from the guns was heard in Los Angeles, only twenty miles from Santa Monica, while at Pasadena, ten miles farther inland, there were slight repercussions and doors were shaken. Dr. Beno Guttenberg, geophysicist of the California Institute of Technology, explains this phenomenon with the statement that sound waves travel in an arc similar to that described by a shell, the course of the waves being curved by temperature changes in the stratosphere. A given set of conditions may cause the waves to be reflected sharply down to a small area on the ground far from the source of the sound.

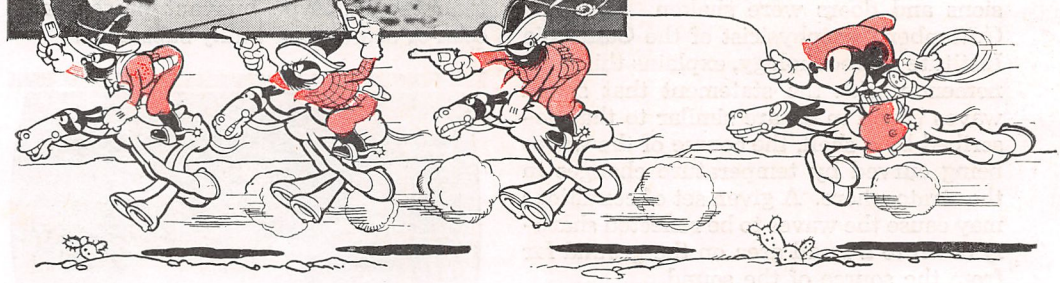
LIFE PRESERVER FOR AVIATOR IS INFLATED INSTANTLY

Army flyers are using a special type of life preserver when traveling over or near large bodies of water. The preserver, which is a rubber cell, is in the form of a vest and slips over the head, being held in position by straps which buckle about the thighs. In an emergency the rubber bag or cell is inflated with gas almost instantly, although it is worn in a deflated condition. The gas supply is compressed and sealed in two small cylinders attached to the front of the preserver. To inflate the vest, the wearer pulls a lever attached to the cylinders. This breaks the seal and releases the gas which inflates the cell. The preserver is light, compact, comfortable to wear and easy to operate. This makes it more adaptable for use over heavy flying clothes than the old type buoyant preserver of cork or some other bulky substance.

Life Preserver for Flyer Inflated by Breaking Seal in Cylinder in Which Gas Is Compressed

Breathing LIFE into

Left, Walt Disney, Creator of Mickey Mouse Cartoons, Examining Sketches for a Forthcoming Production; Above, Ready to Record the Sound Effects for a Cartoon Movie; Note the Ear Phones, Bringing Each Man the Metronome Beat; Right, an Animator Using a Fellow Workman as a Model for a Picture, and an Operator Photographing a Tracing against a Background While an Assistant Is Preparing the Next Set for Photographing



WHEN figures in a series of pen-and-ink drawings were made to blend into an illusion of motion, the cartoon had moved a step forward. Now music accompanies the showing of the cartoon movie, sound effects follow the motions, and these creatures of an artist's pen speak and sing —a magic life has been breathed into the once flat, lifeless drawings!

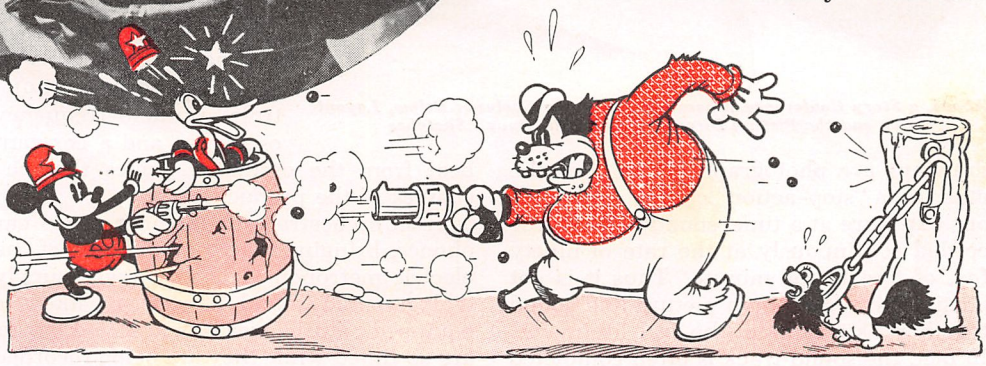
The principle of motion in movie cartoons is simple. In a series of drawings showing a man raising his hand to his hat, the first depicts him with his arm hanging. In the next, the arm is raised slightly and following drawings show the arm at higher and higher elevations, until the hand finally touches the hat. When the series is passed before the eyes at a rapid rate, it seems that the arm is making a continuous motion.

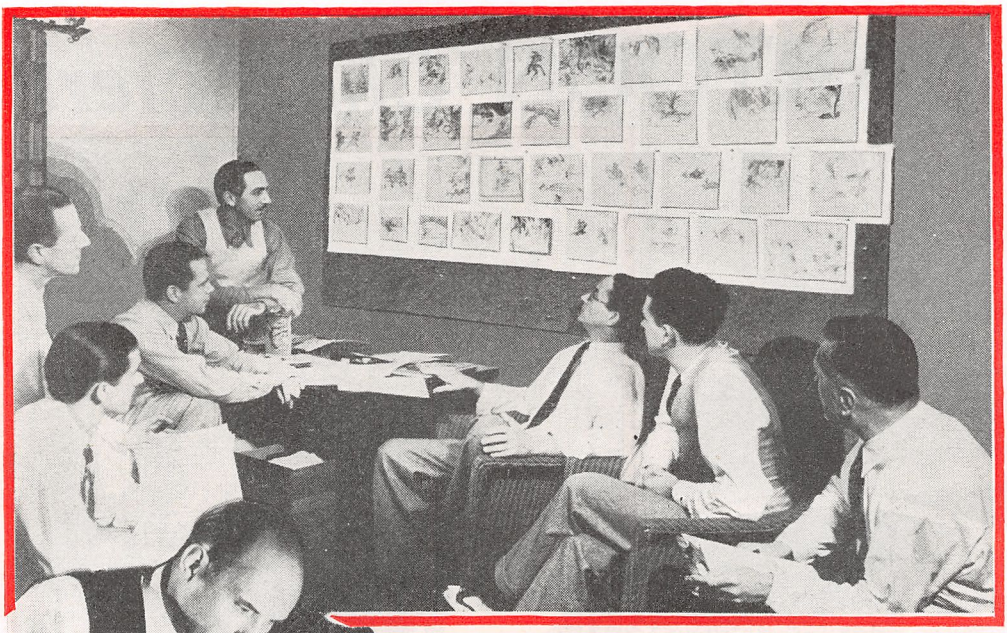
This is because vision "carries over" beyond the point where an object has been removed from sight, and one drawing blends into the next without consciousness of interruption. Movie cartoons are like any other motion picture in respect

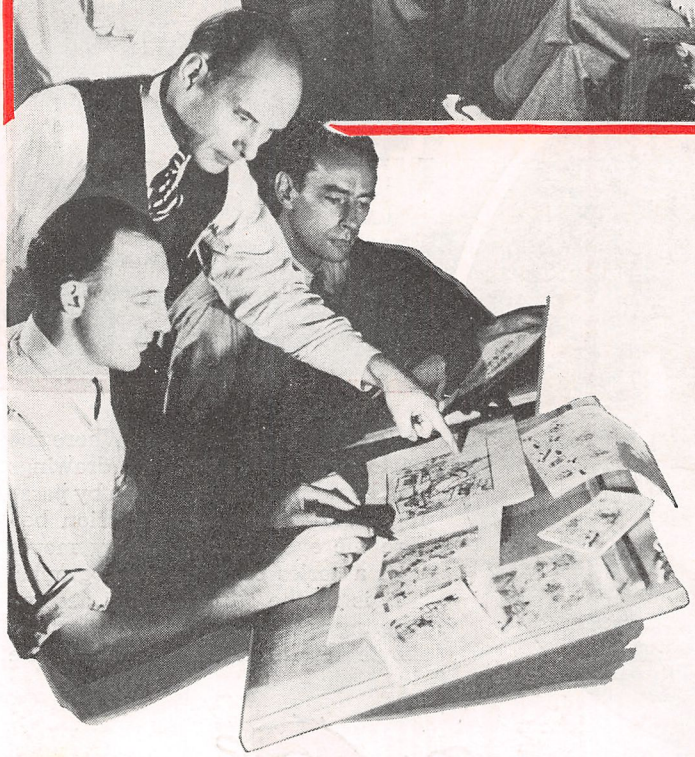
CARTOON *Characters*

to this illusion of motion. Where the cartoon uses a series of drawings and blends them into motion by passing them rapidly in succession before the eyes, the ordinary movie uses a series of "still" photographs.

It is in the sound effects accompanying the picture that the cartoon movie differs radically. While the







Above, a Story Conference Where the Ideas Are Evolved; Below, Layout Men and the Picture Director Making the Rough Sketches

drawings are photographed one after the other by a "stop-action" camera that takes one exposure at a time, sound must be recorded continuously at the rate of ninety feet of film to the minute. Thus it is not possible to record both picture and sound together, as is done in the real life movie. In fact, the sound track is often completed before the cartoon photographing is started.

Also the music, dialogue, and sound effects, are handled separately. A guide had to be found, so that the several parts of the production, when brought together would match. A steadily bouncing ball was tried, photographed along the edge of the picture so that the musicians could time their music with the action. Then a wavy line was used. Finally, the steady, never-varying revolutions of the city generators were enlisted. A synchronously driven contacting device controls an audio-frequency oscillator, and a constant beat from the oscillator guides the mechanics of the production.

In an orchestra each member wears ear phones, bringing the rhythmic beat of the electric metronome. The men who supply dialogue and sound effects are likewise equipped. Music, words, and sound effects are so timed while they are being recorded

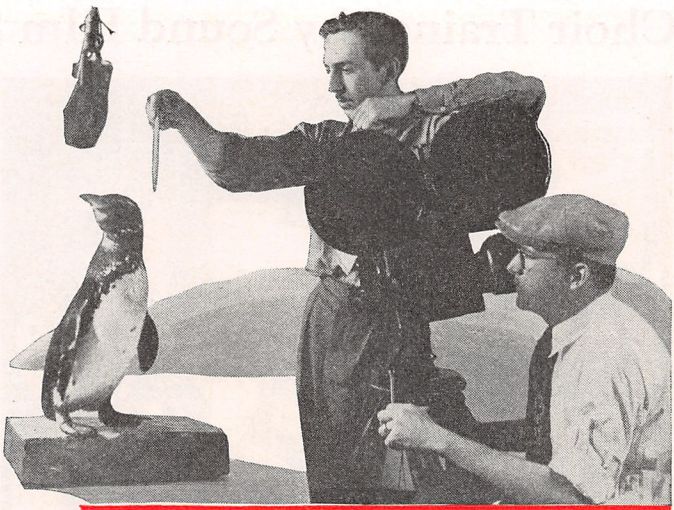
separately that they will later match accurately with each other and with the cartoon action.

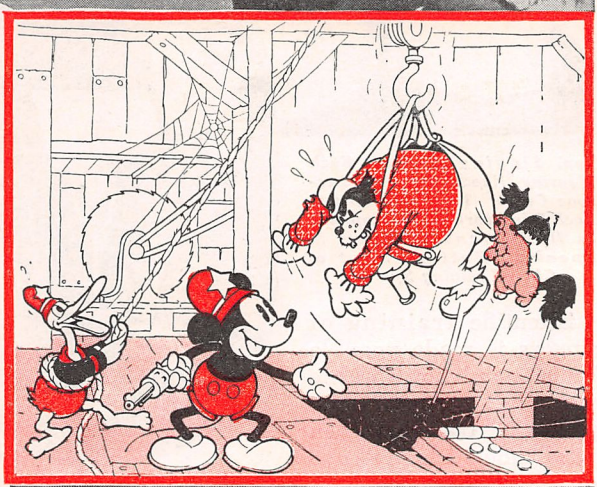
When the sound is finished, the three—and sometimes four—tracks are run at once on separate sound projectors, and the composite sound is fed into the mixing chamber of a recording camera. The negative from this carries the synchronized result on a single sound track.

Film is standardized at sixteen frames to the foot, and projectors run the film at twenty-four frames per second. With this as a basis, the production of animated cartoons becomes a mathematical process. The script is divided into scenes and each is allotted a certain number of feet of film. The scenes are numbered to guide the cartoon animators and sound men. If a certain scene calls for twenty-four feet, or 384 frames, of film space, the cartoons are drawn so that the action is completed in just that length. Converting this into time, the musical director handling the sound for that scene must fit his work into sixteen seconds of elapsed time. The parts thus produced come together in the completed film so accurately that often no adjustment is necessary.

Instead of drawing each picture in a series complete with the background, the background for an entire sequence is now done on an opaque sheet of heavy paper, and sheets of transparent celluloid, or "cells," carrying tracings of the cartoon characters, are placed on top of this. The scene is photographed, then another set of cells is arranged in place on the same background and photographed.

(Continued to page 118A)





Top, Trying to Induce a Penguin Model to Change Its Pose by Offering It a Fish as a Reward; Below, Checking Finished Cells, Before Photographing

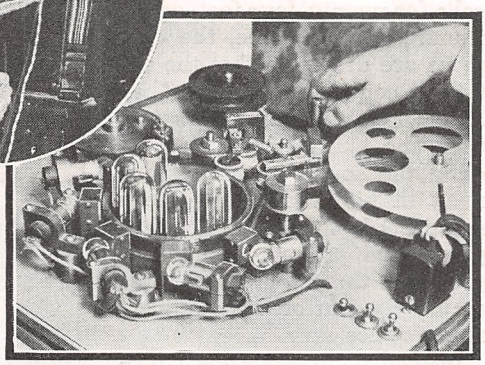
Choir Trained by Sound Film Split into Parts

Top, Singing Pupils, Each Wearing Headphones, at Lesson; Center, Teacher Instructs Each Pupil through Microphone as He Listens to Voices in Speaker; Bottom, Heart of Choir-Training System

Scientific training of singers is made possible by a sound-film device that splits a song into parts and transmits each part independently into different loud speakers or headphones. Thus, the soprano group in one room will hear only soprano parts, the alto group in another room hears only alto and so on, with the tenor and bass. The inventor, Capt. Richard H. Ranger, in the monitor room, listens to the various groups separately and then to the complete melody by operating control switches. With the aid of a microphone, he instructs the groups as they sing. The basis of the invention is a small film on which have been recorded five sound tracks, side by side, one sound track for soprano, another for the alto, a third for tenor, a fourth for bass and a fifth for the complete melody. This film passes around a drum before five different photo-electric cells. In front of each photo cell is a miniature auto headlight and a small lens for bringing the rays of the light into focus, these rays then passing through the film to the cells. Thus, the sound is carried to five separate rooms, each part going to a different loud speaker or to headphones worn by each singer. It is possible to train the choir together, each singer listening only to his part in the headphone.

PHOTO CELL GUIDES POSTAGE STAMP PERFORATOR

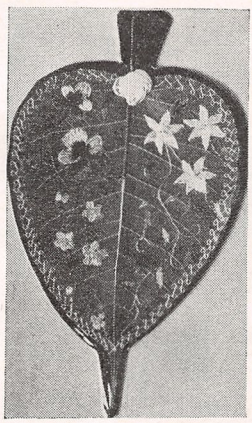
Because of the many complaints by collectors about postage stamps being out of alinement, an engineer of the bureau of printing and engraving was assigned the task of straightening the alinement of stamp perforations, an important item



with the collectors. As a result, photo-electric cells now are employed to guide the perforator. These cells, acting on opposite borders of stamps, serve as automatic eyes. When the perforator veers from center, the cells activate a compensating mechanism which turns the puncher back on the right line. During the last fiscal year the perforators operated on twelve billion stamps, punching 370 trillion holes along the borders. The paper which fell from the holes weighed thirty-five tons.

LEAF AS EMBROIDERY BASE RESULTS IN NEW BEAUTY

Poplar tree leaves treated to remove the leafy structure and leave only the fine veinwork, are used as a base for embroidery by a Cuban girl. The leaf is cut from the tree, those that have fallen being of no use, and placed in water for from fifteen to twenty days, the water being changed every day. This bath softens the green leafy structure so that it may be removed with a soft brush very carefully used with a patting motion on both sides of the leaf until nothing is left except the veinlike skeleton. The leaf is then hung in the air until perfectly dry. Then the desired design is drawn on the leaf, care being taken not to break the fine network of veins of the leaf. Only the outline of the design is drawn on the leaf. The design is then embroidered in regular stitches with silk thread of various colors. In such parts as the petals of flowers, one color is frequently put over another, in part, at least, to produce a raised effect as in other embroidery. The leaf is frequently finished with a small silk flower placed at the point where the stem joins the leaf.

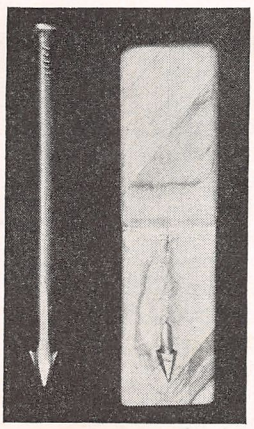


CLOTH IS MADE WATERPROOF BY USING "BAKELITE"

Made from a durable fabric treated with a flexible Bakelite resinoid material, a cloth is being produced which is resistant to water, oil, alcohol, fruit juices and most other liquids which stain or corrode. The cloth is available in several weights and a variety of metallic finishes, patent leather and gaily printed designs. It can be made into raincoats which can be rolled up and tucked into a handbag, slippers which can be cleaned with a damp cloth, colored sports overcoats and golf jackets. It is used for stage settings and costumes and in the home it is employed for curtains, valances, wall and shelf covers, decorative screens, card-table covers and shower-bath curtains. Burning cigarets have little effect on it, soapy water does not harm it and it does not stiffen with age. Should it become wrinkled, it can be ironed smooth.

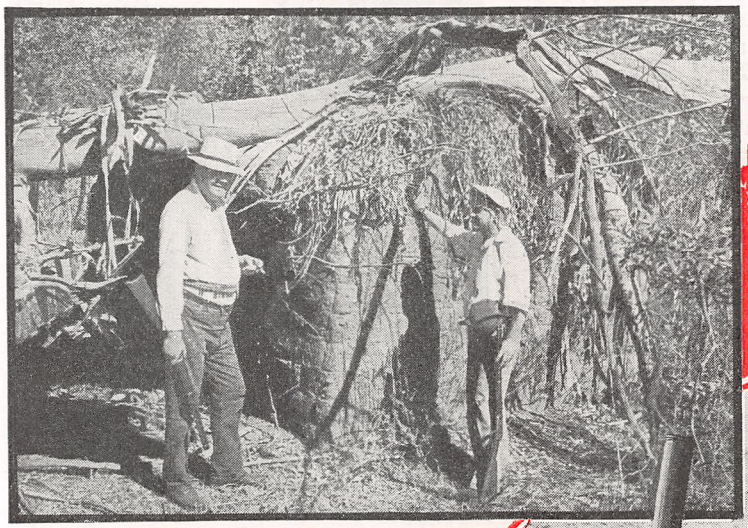
Raincoat and Samples of Fabric Treated with "Bakelite" Resinoid Material to Make Them Waterproof

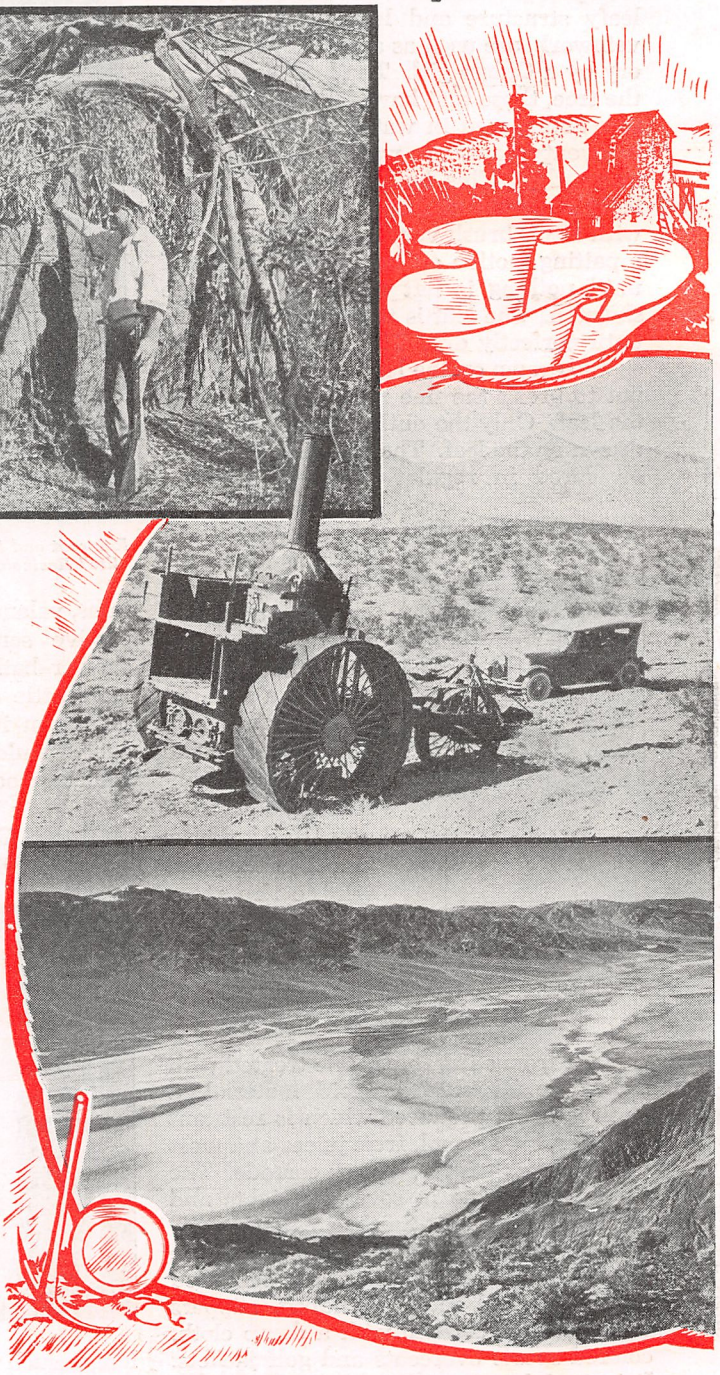
BARB ON SELF-LOCKING NAIL RESISTS WITHDRAWAL



Self-locking nails which cannot pull loose when once driven into wood are equipped with barbed tips, the barbs constituting the locking feature. The nails drive easily, but the force needed to extract them must exceed the strength of the wood fibers in which they are imbedded. The longer such nails remain driven, the tighter they hold, it is claimed, due to the moisture changes in wood.

SECRETS *of the*





AMONG the legends of the old west are many stories of mysterious "lost mines" that are still hidden in the hills today in spite of years of patient search.

Some of them were lost when the discoverers forgot their way in the desert and couldn't retrace their steps. Others became legendary tales after the owners had died without leaving records of their locations. Scores of men have perished in the hunt for the elusive ore bodies although others have made strikes that were just as good or better than the mines they were seeking.

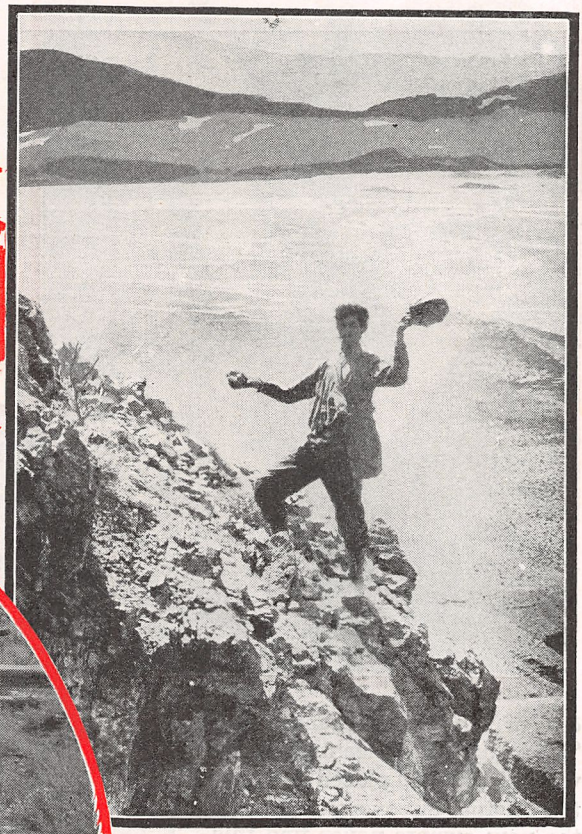
Many of the lost mine stories are classified as mere prospectors' yarns, but now that the west is being combed diligently for gold and silver the secrets of some of the real lost mines are being rediscovered. Such is the case of the long lost "mine with the iron door" worked by the Spaniards centuries ago. It received its name when the owners con-

Lower Photo Courtesy Auto Club of Southern California

Adobe Hut Used by Early Miner, Steam Tractor Abandoned after Being Used to Haul Ore, and a View of Death Valley

LOST MINES

Right, Signaling Discovery of Ore; Below, Ore Crusher Used by Spaniards, and "Shorty" Harris, Prospector Who Made Strike While Hunting for Lost Mine



cealed the source of their treasure under a dump of iron ore when hostile Indians drove them away. Only contradictory tales of the old mine remained and even its approximate location was unknown until several years ago, when the skeleton of a burro was found beside a bullskin containing thousands of dollars worth of high-grade ore in an eroded creek bank near Oracle, Ariz. With this clue to guide them prospectors finally uncovered the old mine.

The secret of the "Lost Shepherd," another of Arizona's famous lost mines, was solved last year by two prospectors who found a caved-in shaft and a small ore dump alongside a ledge of quartz ore that assayed $1,000 to the ton. Hidden in a tunnel of the old mine, says

Examining Sample from Rediscovered "Lost" Mine, Charge of Chemicals Used in Assay Test for Gold, and Testing Sample in Assay Furnace

one of the many legends, is a "cleanup" of concentrated ore worth $5,000,000 placed there by the original discoverers. Even if the new owners never find this treasure they will make a fortune from the rich ore.

Near Mesa, Ariz., was recently found the "Lost Padre," another mine worked by the Spaniards and lost when Indians forced them to abandon their work. The remains of an old stone building beside a shaft aided in identifying the mine.

An old Yaqui Indian revealed to Jesus Garcia and several others the location of an ancient gold mine that had laid undetected for decades within plain sight of motorists on a well-traveled road near Sonoyta in Sonora, Mexico. The old ore dumps looked like natural sagebrush-covered mounds until the Indian gave away the secret that his tribe had known for generations. Prospectors believe other Indians could lead them to several lost mines if it were not for tribal taboos that forbid their telling of or even working in gold mines.

How do mines become lost in the first place? A typical story of a lost mine is told by a store owner in a small Nevada mining town.

"Years ago," he said, "a friend of mine staggered into town almost out of his head from starvation and thirst. In his pockets were hunks of rich ore. He said he had found hundreds of tons of this stuff, the vein was a yard wide and he had it all staked out. If the rest of the ore were only half as rich as his samples he would be a rich man and I congratulated him. A week later he started back into the desert

with an outfit to go to work. The next thing I knew he was back in town for another grubstake. He hadn't been able to find the outcropping and he was trying again. He thought he knew just where it was, but he had lost his way after first discovering the ledge and it's still out there waiting to be found. Now it's a lost mine. The chances are that only a few inches of the high-grade ore are visible and that it will remain a mystery until someone is lucky enough to stumble on it."

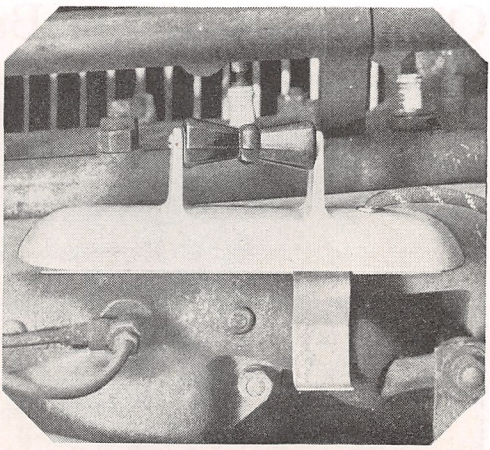
Not long ago a Los Angeles mineralogy instructor gathered several dozen samples of rock on a trip through the desert to show his students as specimens. Back at school, while demonstrating how an assay test for gold is made, he ground up one of the samples and put it in the furnace. To his amazement he found a tiny button of gold in the bottom of the crucible. The instructor thought he knew just where he had picked up the sample and went back to file a claim on the ledge. But he hasn't found the same ledge yet although he has prospected every canyon in the vicinity.

Thirty years ago much of the west was unexplored and a man who wandered through the hills for several weeks had a hard time going back to the spot where he had found good ore. Even today, although much of the desert has been surveyed and good roads criss-cross all parts of the west, a prospector may lose his way. Hundreds of square miles of hills look much the same and one canyon closely resembles another.

To a trained mineralogist a specimen of ore is as individual as a fingerprint and what convinces even a cynical engineer of the existence of some of the ghost mines is the fact that the first discoverers brought back samples unlike any other ores in the district. One such mine that has been sought unsuccessfully since the middle of the last century is the "Lost Cement Mine" somewhere in the mountains near Mono Lake, Calif. The mine consists of a vein of white cementlike material studded with chunks of gold. The man who found it worked it for years but kept his secret so well that no one ever followed him to the ledge and no one since has been able to discover the same ledge.

The "Lost Pegleg," is supposed to be

(Continued to page 122A)



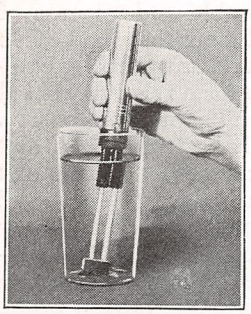
Electric Motor Warmer Which Heats the Metal of the Engine and Enables Easy Starting

ELECTRIC HEATER FOR MOTOR AIDS IN STARTING CAR

Starting the car on a cold morning is made easier if an electric motor warmer is connected to it during the night. The heater, shaped somewhat like a flatiron, operates from a light socket and uses about one kilowatt of electricity for one night, or ten hours, of operation. It clamps on the intake manifold and keeps the metal of the engine warm by direct contact. It is claimed it will warm a cold motor enough so it can be started easily after only a few minutes of operation.

POCKET-SIZE WATER PURIFIER USES SMALL BATTERIES

Standard flashlight batteries provide the current for a pocket-size water sterilizer that is effective with only ten seconds of immersion. Two silver electrodes, attached to the sterilizer, may be removed and packed with the other equipment in a molded case. The sterilization is accomplished by small quantities of ionic-silver released in the water by the silver electrodes. The treatment does not change the taste, smell or color of the water.



Old Wooden Ships Burned to Salvage Metal

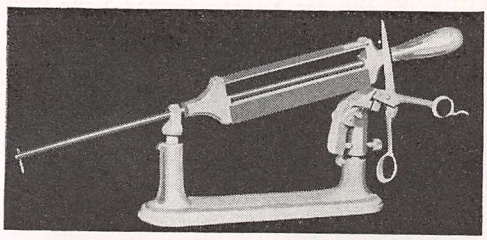
Large Wooden Ship in Flames Started by Salvage Crew; After All Wooden Structure Has Been Destroyed, the Metal Is Taken from the Hulk; Note Tiny Figures of Salvage Crew on Beach at the Left

During the last decade at least fifty wooden ships have been burned on the Pacific coast to salvage the metal in their hulls. Scrapping ships by hand is impracticable because of high labor costs. Infrequently hulls have been broken up for firewood but the trouble and expense of separating the metal from the wood made the job unprofitable and unworkable. Having purchased a ship for a relatively small amount, the salvager has many problems to solve. He must have tugs, scows and other equipment for handling the job and he must have a market for the salvaged metals. The costs are so heavy that only when there is a good demand with comparatively high prices for steel and iron scrap does the undertaking offer a profit. A suitable burning site must be found. A sandy beach is necessary, not too close to forests, dwellings or other buildings. There must be a wide tide range. The beach must be as close as possible to urban facilities otherwise the cost of towing the ship to the beach and freighting the salvaged materials back to the market would eat up the profits. The first job is to strip the hull of all salvable material, including anchors, chains, donkey boiler, windlass, hoisting winches, steam pipes, kitchen utensils, bedding, sails, rope and provisions. Then the ship is towed away to be burned. At high tide the tug hauls the ship as far up on the beach as possible. When everything has been placed in proper order the salvager awaits calm weather before applying the torch. About two hours before high tide the fires are lighted. Quickly the flames spread, transforming the hull into an inferno. As the tide recedes the heat dries out the underwater section of the hull and the flames spread to every section. Within forty-eight hours the wreckage is sufficiently cooled to per-

mit handling. The wrecker floats a scow alongside. A steam caterpillar and crane pull the metal pieces from the mass and load them on the scow. In the case of long metal straps it is often necessary to cut them to convenient lengths with acetylene torches. When loaded, the scow is towed to the port's terminals where the material is usually transferred to freight cars to be hauled to a steel mill or to a modern steel ship bound for foreign ports. Several years ago, Puget Sound witnessed the burning of thirteen hulls in one pyre.

SHARPENER FOR SCISSORS USES BOTH FILE AND STONE

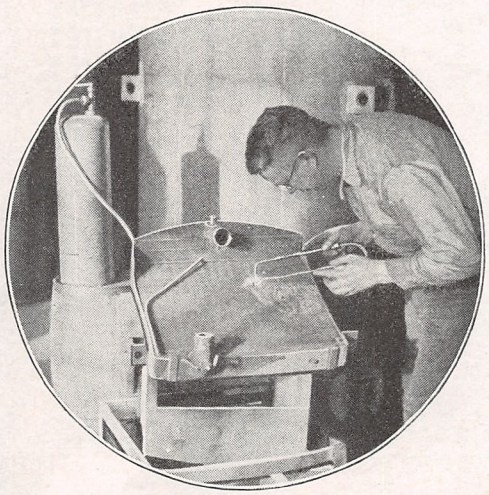
Built to hold the blades in an accurate position for grinding, a sharpener for scissors has space for both a file and a stone or for two stones of different fineness. The blade of the shears is clamped in a vise at one end of the sharpener and adjusted to a height which brings the edge of the scissors and the abrasive surface of the tool parallel by raising or lowering a ball-bearing head at the opposite end. The file or a coarse stone first is operated across the inner edge of the blade, then the finer stone is revolved into position and run over the edge. Stones of varying degrees of fineness can be obtained and are interchangeable. The castings are of aluminum.



Scissors Sharpener Which Holds Blades at Best Angle for Grinding; It Has Both a File and Stone

SOLDERING TORCH KIT WORKS ON GAS FROM TANKS

Designed for use with acetylene gas supplied in portable tanks, a new soldering outfit has many uses in small towns and farm homes where commercial gas is not available. The outfit operates with the small tank formerly used for lighting purposes, instead of the large commercial tanks. It includes a torch, four tips of various shapes, a soldering copper and hose and connections for the tank, which can be rented from dealers. No oxygen or

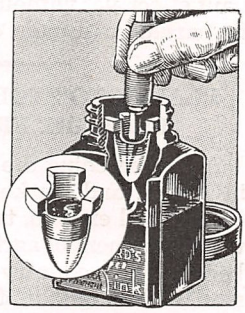


Working on Radiator with Portable Soldering Outfit; Note the Acetylene Gas Tank

compressed-air tanks are necessary. Preheating is eliminated, the gas being ignited as soon as the connection to the tank is made. The torch heats almost instantly and is then ready for soldering, radiator repairing, lead burning, melting, tempering, light brazing, battery work, aluminum soldering and other work. The small size of the tank makes the outfit easy to carry.

INK BOTTLE WITH TOP WELL IS ALWAYS "FULL"

Smearing the penholder with ink or tipping the partly empty bottle to fill a fountain pen is unnecessary if the ink bottle you use is one containing a removable well which fits at the base of the neck. Ink is supplied to this top well by tightening the screw top, turning the bottle upside down and then back to the normal position. The well holds enough ink to fill a fountain pen or the pen can be dipped in the ink without danger of smearing the lower part of the holder.



Illustrating the Latest in Solemn Illumination Effects; Note the Brilliancy Achieved without Glare

MODERN LIGHTING OF CHURCHES BEAUTIFIES INTERIOR

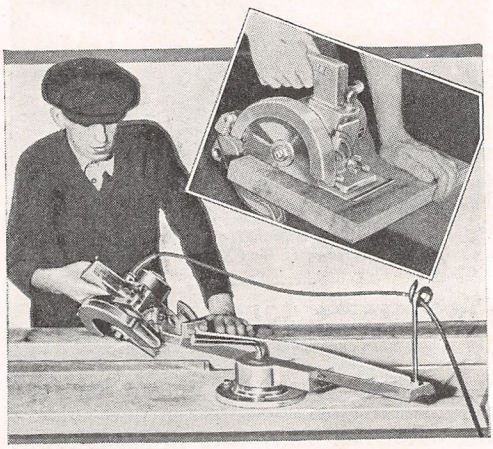
Without sacrificing the solemnity of the surroundings, modern lighting effects are being used to beautify the interior of European churches. German electrical engineers, recently called upon to illuminate a new church in Sweden, used the new "Linestra"tubes, arranging the lighting in accordance with the architecture. A brilliant effect, yet without glare, was achieved by careful treatment of a crucifix.

PLANTS TO STOP SOIL EROSION BROUGHT FROM RUSSIA

After searching the deserts and foothills in Russia and Turkey for plants to help control soil erosion, two plant explorers of the department of agriculture have brought back to this country nearly 1,800 lots of seed, including that of a desert grass which may be uprooted by the wind but "lands on its feet" and takes hold again wherever it comes to rest. Most of the specimens brought back represent grasses which form a thick turf close to the ground, enabling them to hold the soil against wind and water. Others are shrubs whose root systems act as soil binders. Most of the seeds are from plants which are edible by live stock.

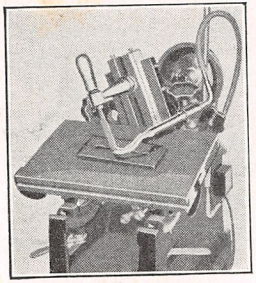
ATTACHMENT CONVERTS PORTABLE SAW TO NEW USES

Conversion of a portable saw to the purposes of a bench saw is accomplished by a table attachment that consists of a sliding arm moving in a turntable bolted to the top of a suitable bench. The arm can be slid to any position or angle and clamped securely in place with a hand lever. This lever locks both the slide and the turntable. Clamps at the working end of the arm hold the portable saw and enable it to be held in any position from vertical to a tilt of forty-five degrees. The arm swings in the turntable sixty degrees to either side. A wire loop at the far end of the arm holds the electric cord out of the way. Using a saw made by the same manufacturer, the outfit will cross cut lumber twelve inches wide and will rip saw lumber eleven inches wide. The maximum depth of cut is one and seven-eighths inches.

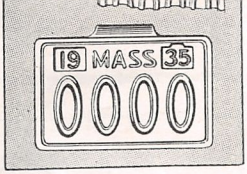


Portable Saw Being Used as Bench Tool by Addition of a Simple Table Attachment

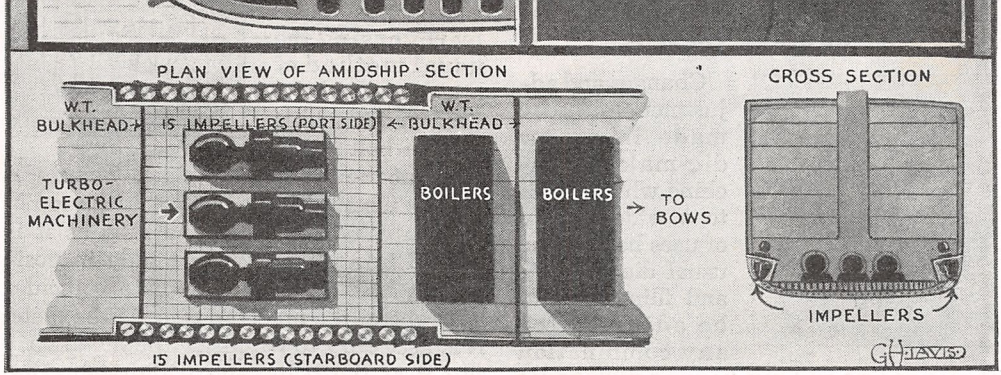
DIE-MAKING MACHINE ADJUSTED FOR VARIETY OF WORK



Changes and adjustments can be made in a new die-making machine which suit it to a wide variety of uses besides the usual die sawing and filing. It can be adjusted for any combination of angle filing and can be used with equal facility for sawing and filing delicate dies or for work on dies and tools of the most



attached to the license-plate holder by reversing the usual method of attaching the bolts and nuts, the smooth bolt heads being at the back of the plate. The metal strip is inserted in a channel at the top of the plate, passing over the nuts as it is shoved into place. When finally in position, a hole in the metal plate coincides with one of the nuts. To remove the plate, it is necessary to withdraw the metal strip to get at the bolts, and withdrawing the strip tears the metal which must be pulled away from the nut.



Hydraulic Propulsion Method Proposed for Ocean Liner; Cone Impellers Amidships Would Be Driven by Reversible Electric Motors; Note That the Usual Steering Gear Is Eliminated

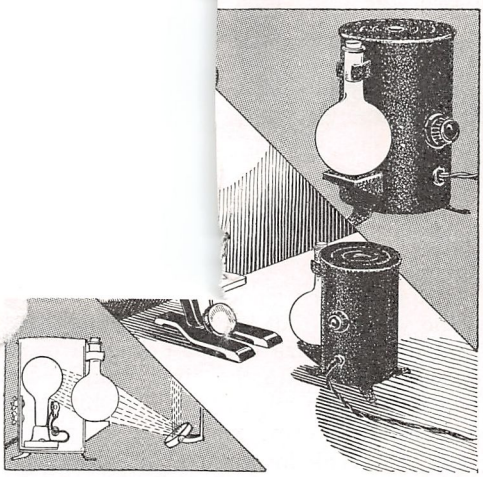
Bottle Breaker "Digests" Empty Containers

Under a government regulation which prohibits the refilling of used liquor bottles, many hotels and cafes break the empty containers in order to protect themselves. A bottle-breaking machine for this purpose has been developed recently and consists of a chute leading into a metal box into which a shaft from an electric motor projects. The end of the shaft is equipped with several arms which are revolved by the motor and break the bottles. The latter are fed in by hand and are broken into one-half inch pieces or smaller. The broken pieces drop into a bag and thirty barrels of bottles require only one barrel to contain them after they have been "digested" by the breaker.

Bottle Breaker Which "Digests" Glass Containers, the Broken Glassware Finding a Ready Market

MICROSCOPE LIGHTING IS IMPROVED BY FILTER LAMP

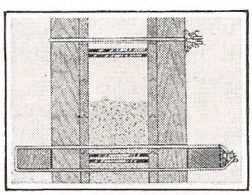
Daylight is simulated by a new microscope lamp using a fluid lens ...ter solutions in standard ...eadily obtained and eas... convenience to those using filters of various colors. The lamp gives more than adequate light for high-power work, oil immersion, binocular and tilted eyepiece, and it is exactly suited to photographic work. It may be used with any microscope. The outfit, made of steel, can be operated with any lamp from ten to 100 watts on standard 110-volt circuits.



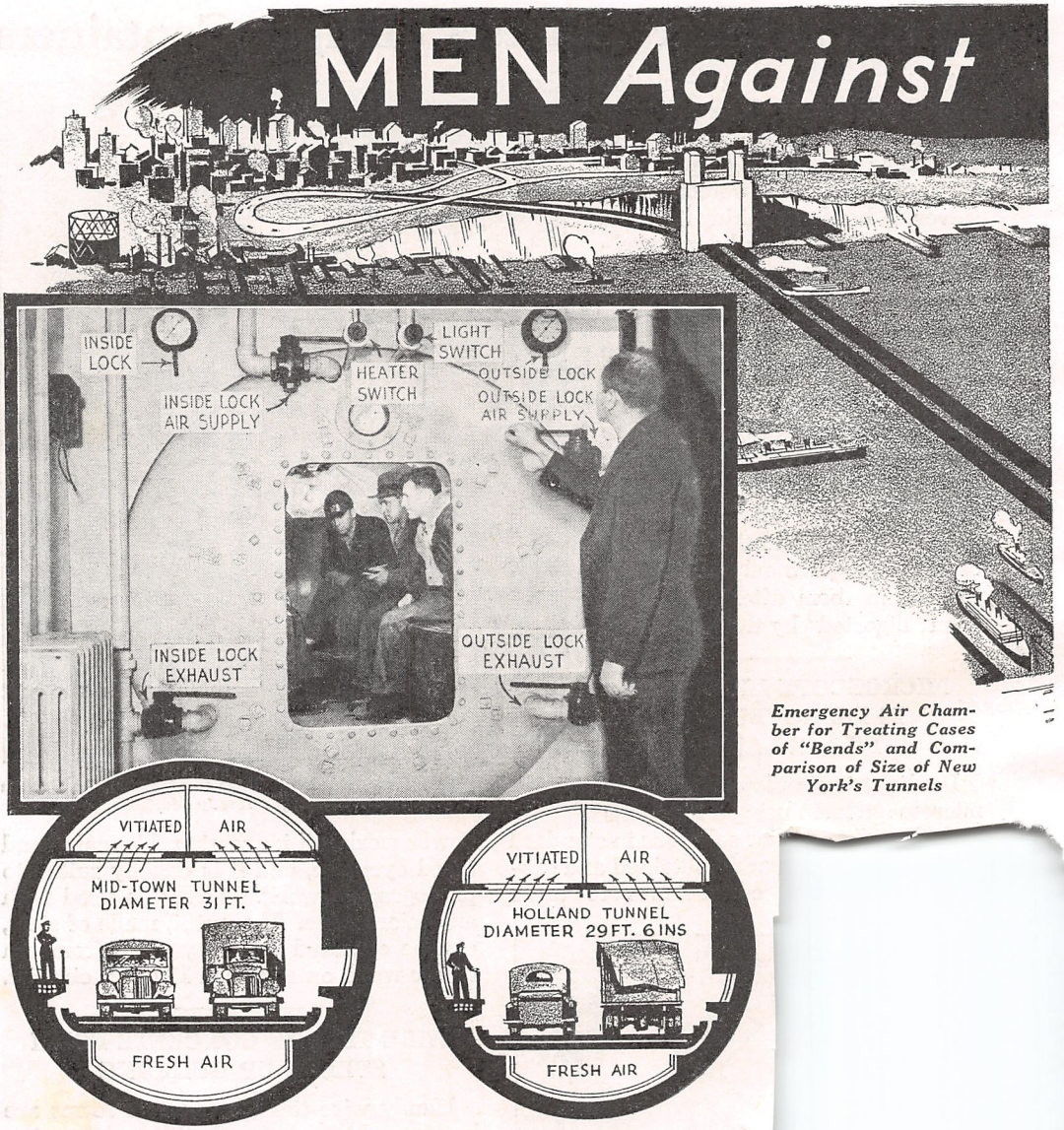
Microscope Lamp with Filter; Bottom, Left, Illustrating How the Lamp Works

WIRE TIE FOR CONCRETE FORM SPEEDS UP BUILDING

Handy wire ties for concrete forms are being used to speed up building. The wire, which is used to hold the forms together, is not twisted as is the case under old methods. Instead, the wire is simply wound up on a spool-like holder, the ratchet teeth of which sink into the wood, preventing the wire from unwinding. The operation is simple, quick and efficient. The method is said to eliminate breakage of wire that frequently delays work.



MEN Against



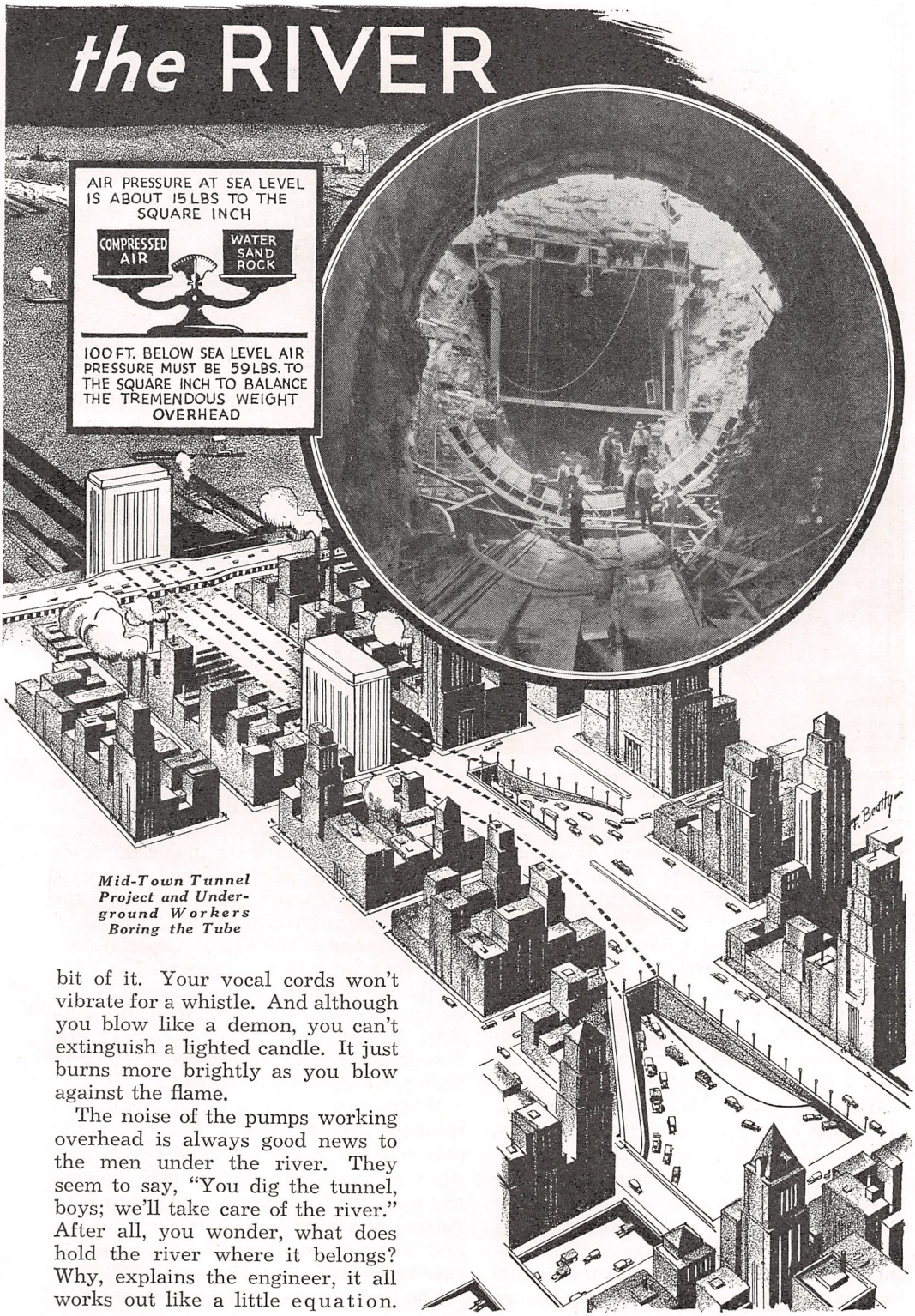
Emergency Air Chamber for Treating Cases of "Bends" and Comparison of Size of New York's Tunnels

NEW YORK'S Holland tunnel, the first vehicular tunnel under the Hudson river, has proved such a success that the government is financing a new $37,500,000 tube to take care of the growing auto traffic between the states of New York and New Jersey.

Muckers and sand hogs, engineers and blasters are working today sixty feet below the keels of the ocean greyhounds where the air rings like an anvil, where a man cannot smoke for fear of an explosion, where a million tons of mud, sand, and water crouch in rea[illegible] them.

A queer place, unde[illegible] mind yourself that it is time for high tide, and you visualize the all-powerful ocean pushing itself into the river mouth. But the men work on, oblivious of high and low tides. Storms may rage or pandemonium break loose up above, but all is the same under the river. No day, no night. Just incandescent lights and air under pressure charged with oxygen.

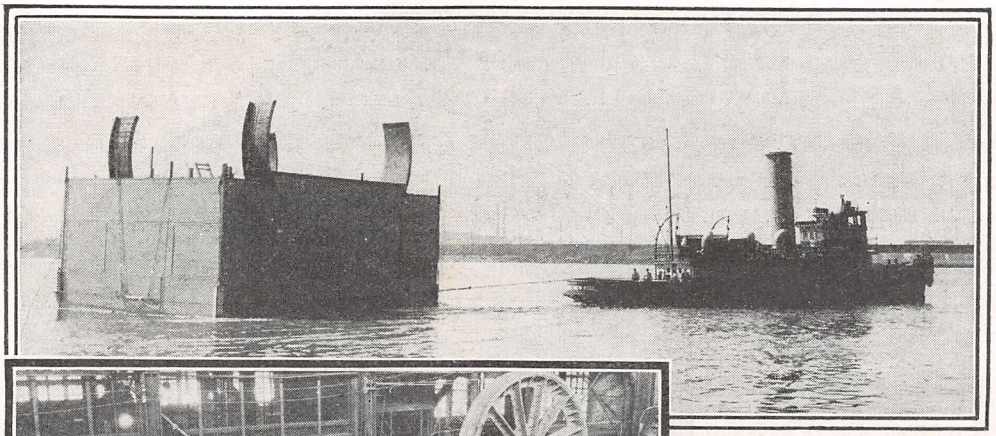
Can you whistle under the river? Not a

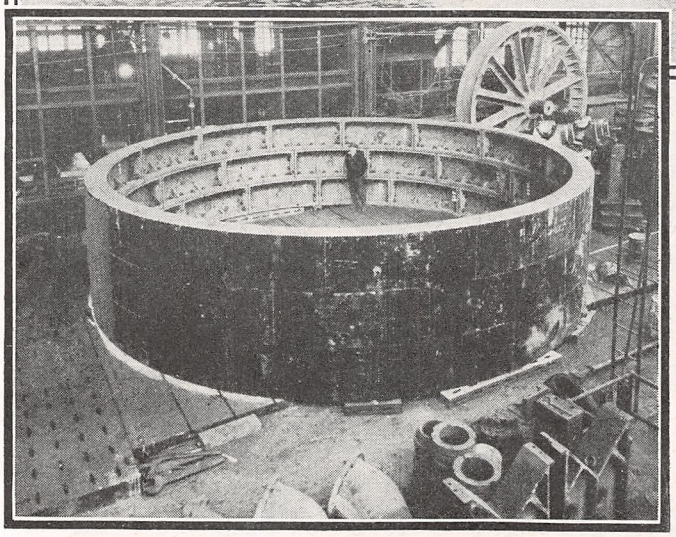


Mid-Town Tunnel Project and Underground Workers Boring the Tube

bit of it. Your vocal cords won't vibrate for a whistle. And although you blow like a demon, you can't extinguish a lighted candle. It just burns more brightly as you blow against the flame.

The noise of the pumps working overhead is always good news to the men under the river. They seem to say, "You dig the tunnel, boys; we'll take care of the river." After all, you wonder, what does hold the river where it belongs? Why, explains the engineer, it all works out like a little equation.





Towing River Shaft Caisson to Drydock and One of the Cast Iron Tunnel Lining Segments for the New Tube

You balance the water of the river against the air pressure in the caisson. If you upset that delicate balance, the air blows a hole in the river or the river blows a hole in the caisson.

The deeper you drive a tunnel under the river, the more air pressure is required to hold the river back. And as the air density increases, the sand hog's pay goes up and his working hours grow shorter and shorter, until he works no more than an hour a day.

Water pressures increase with depth, about half a pound to each foot. Hence at a depth of 100 feet below the river, the water pressure is forty-four pounds to the square inch, which must be balanced by an equal pressure of air. However, this is in addition to the fifteen pounds of pressure at sea level, which means that at 100 feet below the river surface, the pressure is approximately fifty-nine pounds per square inch.

Every possible precaution is taken to insure the air supply and the health of the sand hogs. Each man receives a thorough health examination and is constantly under a doctor's eye. The sand hogs enter the underground works through an air lock, where the pressure is increased gradually. Likewise, on quitting, they are subject to a gradual decompression of the air. As a result of rigid precautions, very few men who work under the river become victims of the dreaded disease known as the "bends." In addition to the regular decompression locks, the sand hogs can take advantage of a special hospital lock kept in readiness all the time. In this steel chamber, the air density can be controlled by an operator on the outside. It provides a gradual compression and decompression, to accustom a man to ordinary atmospheric pressure.

When released too suddenly into the atmosphere, a sand hog is likely to suffer severe aches and has a tendency to reel like a drunken man. To preclude the possibility of his being arrested as a drunk, he wears a special badge, which identifies him and gives instructions for treatment in case he should lose self-control.

The hazards of sand hogging have been

cut considerably. Not a single death from compressed-air illness resulted in the seven years the Holland tunnel was under construction, although there were 756,000 decompressions. Sixty-four per cent of "bend" cases occur within the first hour after men are exposed to the free atmosphere. Hence, the regulations require that they accommodate themselves to it very gradually. While waiting to be decompressed, they play games or talk.

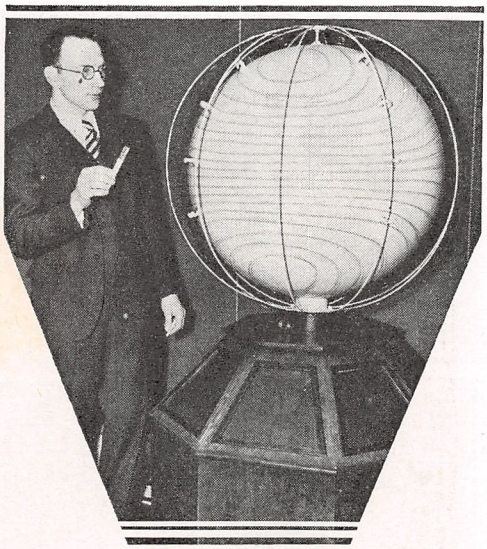
The new Hudson tunnel will have an outside diameter of thirty-one feet, an outside lining generally of cast iron, but in certain places of cast steel, and an inside lining of concrete. The cast iron and steel lining is a ring made up of fourteen segments with a "key" segment added, all bolted together and made watertight.

Most of the tunneling is done by the shield method under compressed air. The shield is like a great cylinder with a sharp cutting edge. It is driven forward through the earth as if it were cutting the core out of a giant apple. The men work under the shield with pick and shovel.

Two separate vehicle tunnels are now projected to form what is known as the "Mid-Town Tunnel." One tube is 7,250 feet long, the other 8,080 feet. The maximum grade against traffic will be three and one-half per cent; with traffic, the maximum grade will be four and one-half per cent. The roadway in each tunnel will be twenty-one feet six inches between curbs, eighteen inches wider than the Holland tunnel. This increased width is necessary for modern trucks and buses.

The capacity of such a tunnel is amazing. Since the opening of the Holland tunnel in 1927, more than 75,000,000 vehicles have passed under the river. About 2,000 cars can pass through each tube hourly.

The ventilation is something which demands the services of many experts. With thousands of cars discharging deadly carbon-monoxide fumes, the air must be changed constantly. In one minute the ventilation towers must deliver 4,000,000 cubic feet to the interior and exhaust an equal amount. Carbon monoxide in the tunnel atmosphere is limited to less than four in 10,000 parts. Engineers are investigating the use of sodium lamps for illuminating the tunnel. If adopted, one-half will be saved in lighting costs.



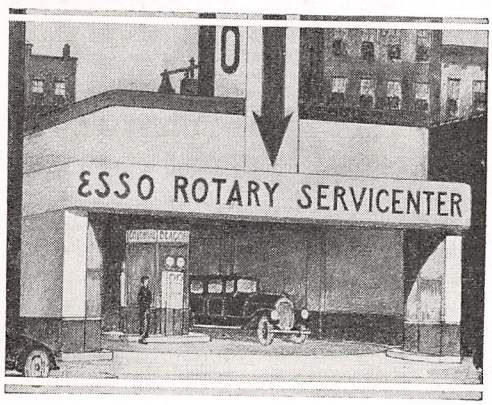
This Globe Shows Changes in Earth's Magnetism

GLOBE REVEALS DAILY CHANGES IN EARTH'S MAGNETISM

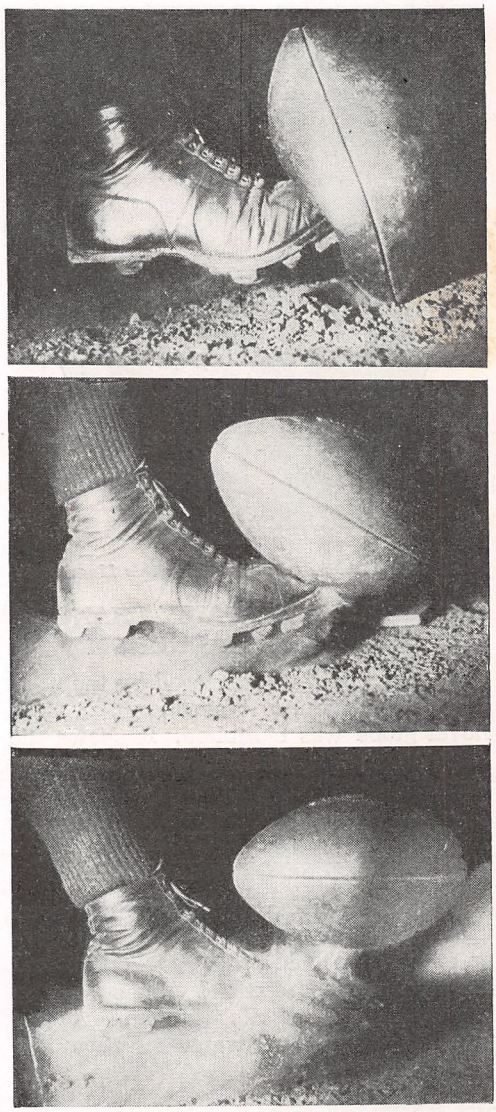
At an exhibition sponsored by the Carnegie Institution, of Washington, D. C., a novel globe was exhibited. It shows the daily changes in the magnetic field of the earth.

REVOLVING SERVICE STATIONS SAVE TIME OF MOTORISTS

Revolving service stations are the latest time-savers for motorists. The car is driven onto a turntable which revolves around the dispensing equipment. This speeds up the work of attendants who can service a car with gasoline, oil, water and air in less than two minutes.



Turntable for the Car Speeds Up Servicing



Three Views of Foot Meeting the Ball; Top, Note Depression in Ball at First Impact

CAMERA CATCHES A DROPKICK AS TOE MEETS FOOTBALL

What happens when the player's toe meets the football in a dropkick is revealed in photographs taken with the aid of high-speed electrical flashes. The camera exposure time was one-one hundred thousandth of a second. Valuable information on the "mechanics" of the dropkick, which is used frequently in football games to score a field goal, is obtained by this process. The photos show the impact of the foot against the ball, causing it to be depressed at least half of its diameter. Then the ball recovers its full form and begins to rise, a halo of dust appearing just ahead of the ball. Finally, the completed kick is shown, the foot back on the ground and the ball soaring into the air. The fast exposures were made at the Massachusetts Institute of Technology.

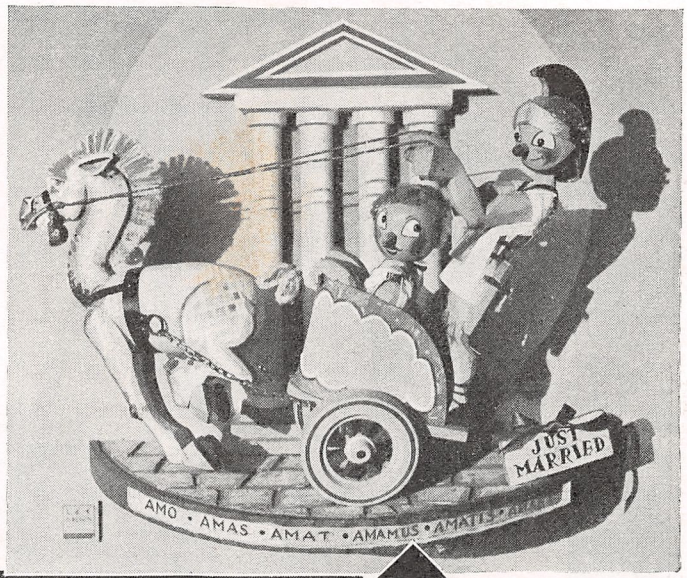
SPINNER TESTS AUTO WHEELS WITHOUT ROAD RUNS

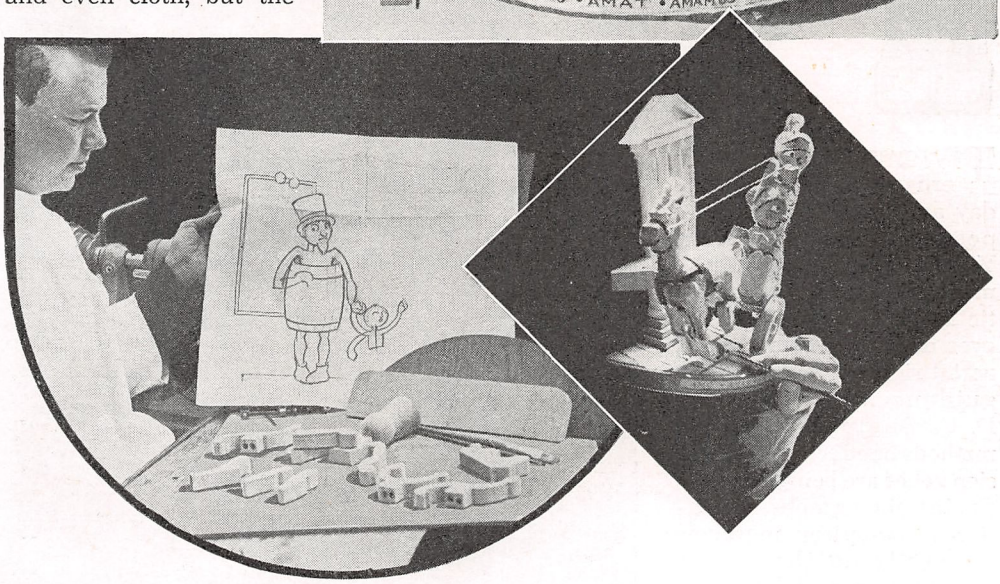
Eliminating hazardous road tests for "shimmy" and wobble, a dynamic spinning device subjects each wheel to a similar test without removing the car from the repair shop. The machine consists of a spinner wheel mounted on the shaft of an electric motor and carried on a small rubber-tired dolly. The speed of the motor is controlled from the end of a tubular handle like a vacuum cleaner. The spinner wheel rocks from side to side for adjustment to the plane of the cambered auto wheel so that the tire will not be damaged. The test is made with the wheel on the spindle, each wheel being jacked up and spun with the machine. The motor quickly accelerates the wheel to eighty or 100 miles per hour. When the shimmy speed is reached the whole car shakes violently, indicating the wheel is out of balance and that it should be removed and trued up.

Testing Wheels for Shimmy and Wobble; Easily Operated Spinner Eliminates Road Test

Three-Dimension Effect Is Latest in Art Ideas

Art of the three-dimension effect, of the kind found on some magazine covers, is being created by a California artist, Lee Brown. As reproduced on the printed page after photographing, the finished three-dimensional idea, which is almost like a miniature stage as it leaves the artist's hands, appears to foist itself right out at the reader. Various methods to obtain desired effects include working with soap, clay, sponge, cardboard, tin, plaster of paris, and even cloth, but the





Top, Finished Model That Achieves the Impression of Depth as Well as Height and Width; Bottom, Right, Side View of Model; Left, Beginning Work on Wooden Model, Following the Sketch

Californian uses wood. First he makes a thumbnail sketch of an idea, then enlarges it into a pencil drawing, to scale, of the finished model. Carving and turning by lathe of the segments follow. In the next step the figures are assembled and glued, then bolted firmly with concealed fastenings to a wooden background and base on a stage. Finally they are painted and garbed. For publication the model, which is made to be shot "full front," is photographed in color, then transferred to engravings by regular processes. The artist gained his training by building model boats, making Christmas cards, dabbling in all phases of art, studying stage craft and the methods of photo-engraving. Some knowledge of each has proved essential in this new art. All his work is done in his shop at home.

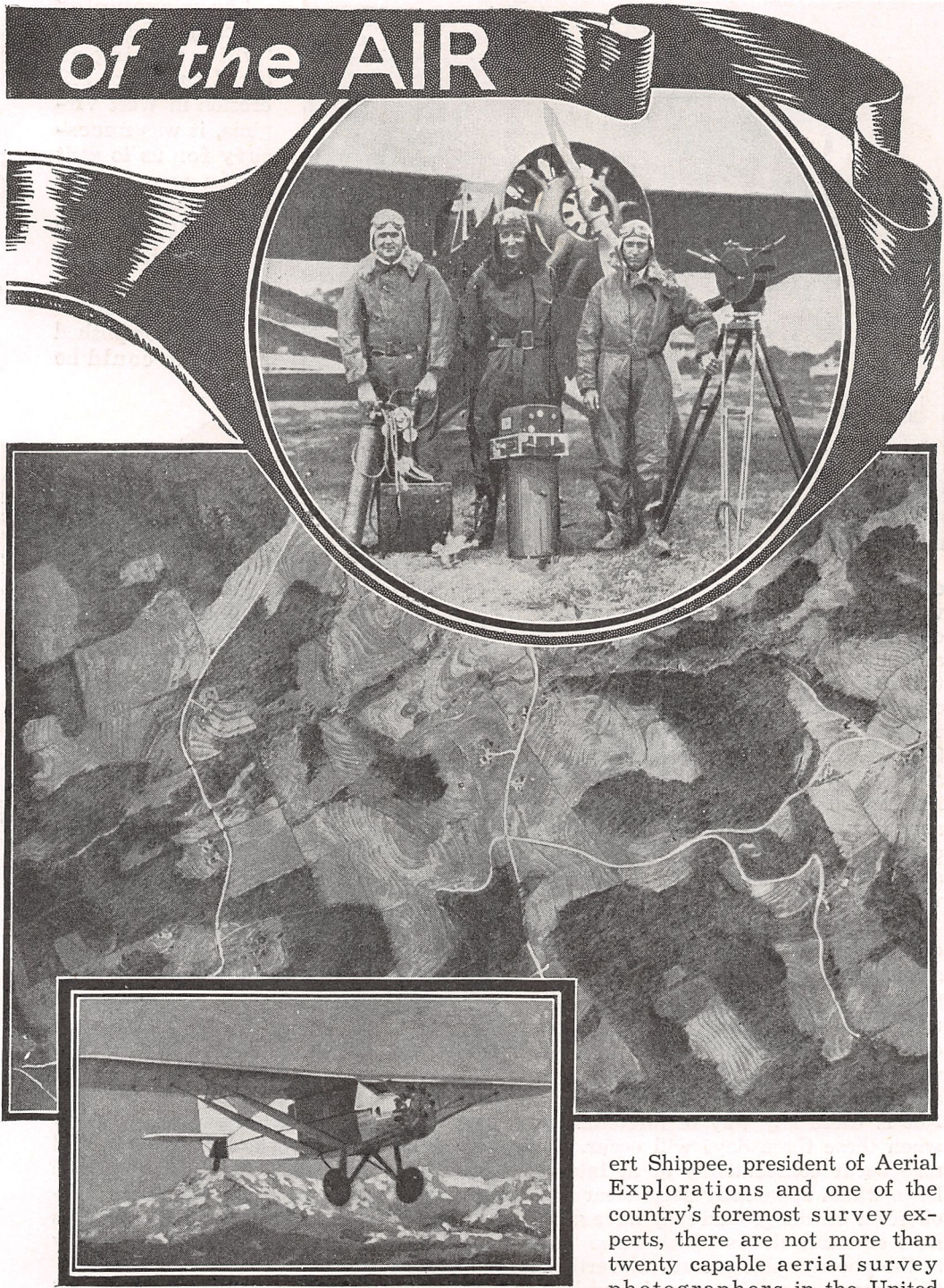
EYES

THE eyes of the air—modern aerial cameras—today are busy at a thousand peacetime tasks. In New York City where 5,000 workmen are building the gigantic Triborough bridge, the eyes of the air compiled an aerial right of way for their guidance. In Washington, D. C., engineers studying methods of effecting soil erosion relief are being aided by aerial photographs. Scientists in American museums are studying the curious markings on aerial photographs of Peru—pictures which may cast new light on the ancient Incas. Elsewhere cartographers are piecing together aerial photographs of the South Pole which will enable them to accurately map newly discovered land.

Top Photo Courtesy J. Jay Hirz—All Other Photos © Aerial Explorations

Above, Aerial Photographer at Work; Below, a Great Metropolis as Seen by the Eyes of the Air

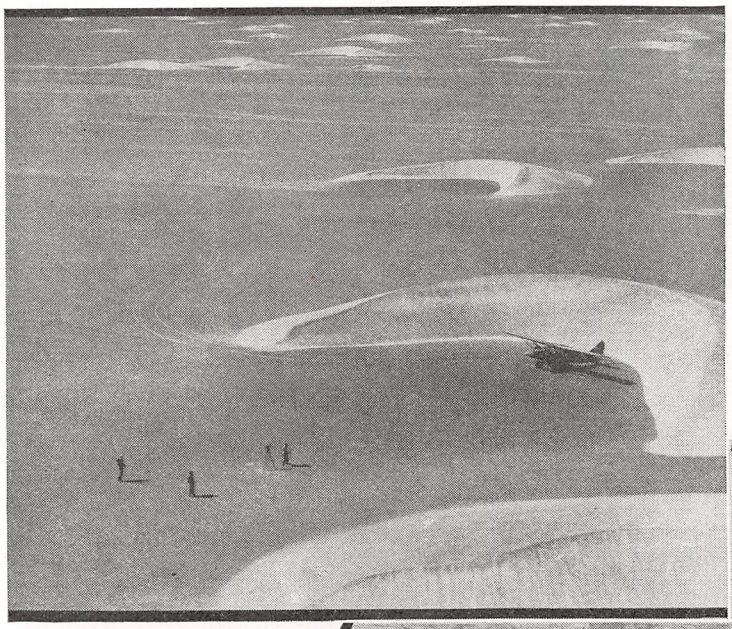
The aerial camera, a wartime development employed to photograph enemy territory has, during the past decade, undergone many refinements and improvements, emerging today as a peacetime aerial eye whose many uses, important though they seem, are still in a pioneer state. So new is the aerial surveying industry that there are scarcely a score of concerns engaged in the business and, in the opinion of Rob-



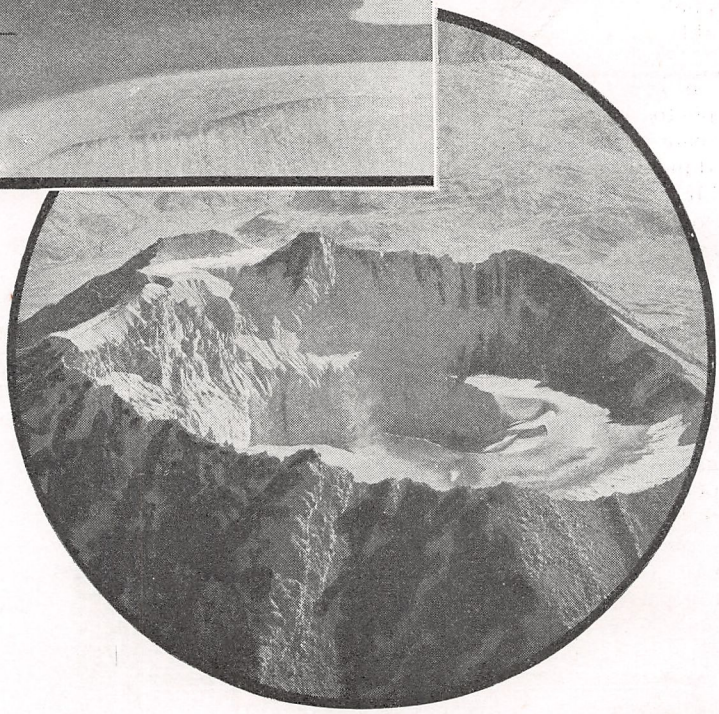
Photograph of Sloping Ground Made to Study Soil Erosion, and an Aerial Survey Crew and Equipment for Making Pictures; Below, Type of Plane Used

ert Shippee, president of Aerial Explorations and one of the country's foremost survey experts, there are not more than twenty capable aerial survey photographers in the United States today.

"Not only is there a dearth of



"As an example," states Mr. Shippee, "while making an aerial survey of soil erosion in West Virginia, it was necessary for us to wait seven weeks for proper weather conditions. When we did get into action however, in three and one-half hours of flying we accomplished more than could be done by a land party of six surveyors working for a period of two years. I say more because the average party of land surveyors generally looks for one specific thing such as right of way or the topography of the traversed area, while the eyes of the air record everything completely and in short order."



Aerial Picture of Traveling Dunes of Peru and the Crater of a Volcano as Photographed by the Eyes of the Air

competent aerial survey photographers to operate the eyes of the air, but there are not two pilots in a hundred especially trained to fly them," states Mr. Shippee. "As this new and rapidly growing industry expands, the scarcity will become even greater unless steps are taken to develop recruits."

In no other business does the weather play such an important part. There is an average of only three flying days per month during which the eyes of the air may function to their fullest extent. Nor is there any way of foretelling just when these three days will occur. They may occur consecutively or at intervals. Days which apparently seem clear to the observer on the ground may have ground haze or small clouds which cause "gaps" in the photographic record. Nevertheless, the amount of work accomplished by the eyes of the air in spite of weather limitation is almost beyond belief.

Dependent upon whether single or multi-lensed aerial cameras are employed, a territory ranging from 200 to 2,000 square

miles may be surveyed in a single day. In the interest of accuracy, each photograph taken on a continuous flight is overlapped by sixty per cent of the succeeding picture taken. When the plane turns to parallel the course it has first flown, there is a "side" overlap of fifty per cent in addition to the sixty per cent lengthwise overlap, thereby making only twenty per cent of each vertical photograph taken available for use.

"The pilot of the surveying plane and the photographer work as a team and there must be a perfect understanding between them," says Mr. Shippee. "If, for example, the surveying plane has completed one lengthwise trip over the territory and has turned to fly a parallel course in the opposite direction, a strong wind may make the pilot fly a course at an angle to his first course unless he is thoroughly competent. In this case side gaps will be found in the complete photographic record, while if the photographer is not thoroughly competent, lengthwise gaps may be found. These gaps are expensive for it means re-flying the course to fill them in."

Two types of aerial cameras are used. One is the vertical camera and the other the oblique camera. The vertical camera usually is mounted so it points downward through the floor and it generally operates automatically. The oblique camera is held in the hand. It takes pictures in perspective which the layman may readily interpret. It is heavy and bulky, sometimes weighing as much as seventy-five pounds. As the oblique photograph is taken outward and downward at an angle between the horizontal and vertical, it not only produces a picture in perspective but one whose stereoscopic factors are now being utilized. If, for example, a mountain is photographed from the air with a mapping camera first from one side, then from the other, it is possible by using a stereoplani-

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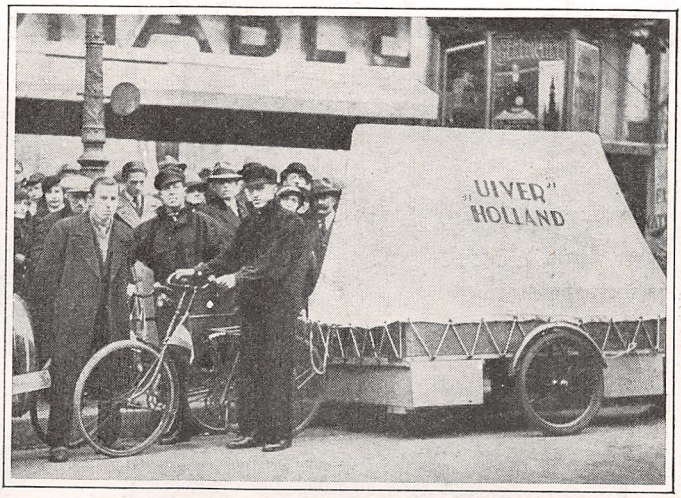


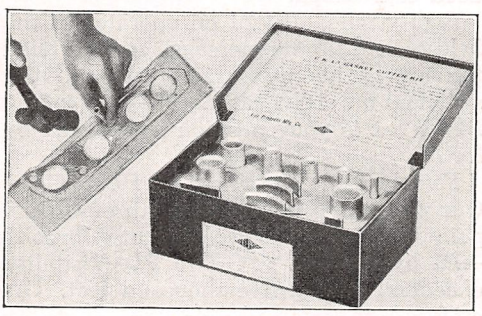
Large Trailer Pulled by Bicyclist; Despite Its Size It Is Lightweight and the Cyclist Towing It Can Make Good Time on Level Roads

BIG BICYCLE TRAILER CARRIES CAMPING EQUIPMENT

Two natives of Holland recently completed a bicycle tour of France, carrying clothing and camping equipment in a roomy trailer pulled behind one of the cycles. The cyclist is able to maintain a fair rate of speed with the trailer in tow.

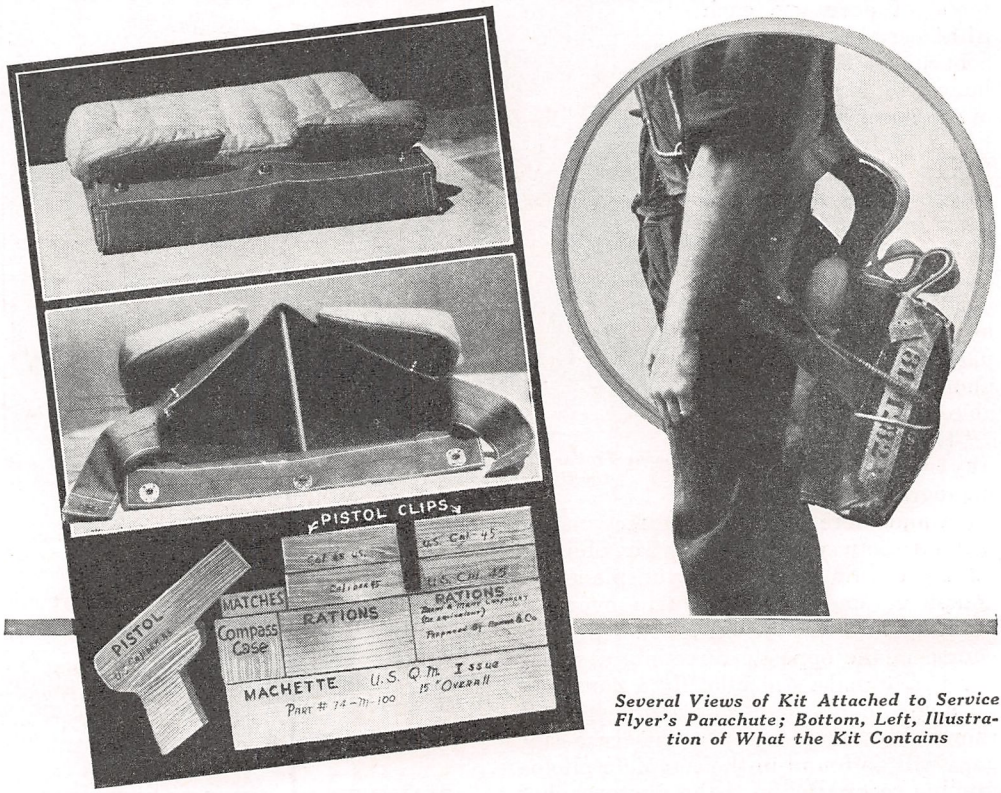
MAKE-YOUR-OWN GASKET KIT FOR HOME OR GARAGE

Home mechanics and garage workers can cut their own gaskets with a new material and cutting kit now on the market. Using the old gasket as a pattern, the mechanic cuts the new one from sheet material constructed of layers of thin aluminum and fine mesh wire bound by an elastic compound. The material can be cut with tools in the kit.



Handy Outfit for Cutting New Gaskets by Using the Old Gasket as a Pattern

Jungle Crash Puts Safety Kit on Parachute



Several Views of Kit Attached to Service Flyer's Parachute; Bottom, Left, Illustration of What the Kit Contains

With the purring ease of mechanical perfection, six of Uncle Sam's single-seater fighters, in the familiar three-plane fighting formation, were returning to Panama City.

"P1 calling P6—P1 by for P6," sounded the voice over the command set to the element leader behind. "P6 to P1—" floated back over the ether. "Received you O. K. —P6 off." Interplane communication had been established.

Eighty miles distant an operator at the field picked up the message. A hum filled the air as his powerful transmitter switched on. "GA calling P1—GA calling P1—What is your position now?—GA by for P1."

Faintly came the answer, "P1 to GA—Our position is ten miles north of Chame point,—What is the weather at Albrook? —P1 by for GA." "GA to P1—Visibility excellent, ceiling five thousand feet. GA off."

Suddenly the right wing man of the second element pulled sharply out. His motor sputtered and the propeller slowed jerkily to a stop—forced landing—three thousand feet up, with a choice of jumping or riding the plane down to a crash in the jungle. The remaining five circled their crippled companion. Down and down, dropping swiftly—two thousand feet—why doesn't he jump?—one thousand—five hundred and too late to jump now.

The powerless plane headed for a flat stretch of jungle swamp between two high hills. Slower and slower glided the plane —twenty feet,—ten feet—crash! The landing gear caught in the high bunch grass and the plane whipped over.

The birdmen aloft anxiously watched the half-concealed wreckage. Two minutes elapsed, but there was no sign of movement. All planes were low on gas. Reluctantly the leader signaled assembly and headed again northeast.

"P1 to GA—P1 to GA—P7 forced down near La Playa river, crashed in swamp,—

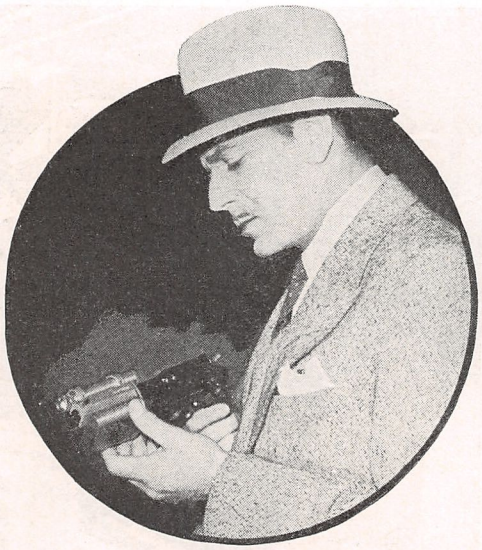
No movement to indicate he is not hurt.—We are low on gas and are coming on in—send plane out to patrol wreck—P1 by for GA." Buzz-z-z-zz sounded the ground transmitter, "GA to P1, GA to P1,—received you O. K.—will notify operations, GA off."

The relief plane arrived fifteen minutes later, to find the pilot seated atop the wreckage waving with one hand and combating mosquitoes with the other. He had been pinned under the wreck and had taken some time to release himself. A map was dropped showing him the way out to the coast. Nine hours later he emerged near a little fishing village a bedraggled figure worn almost to exhaustion. When questioned as to why he had not jumped, with his parachute, he replied. "I was afraid of finding myself in the jungle unharmed, defenseless, with no food, water or quinine. Knowing I had these things behind me in the plane I took the chance of being hurt to get them. I could not have gotten to the coast without them."

As a result an emergency kit was devised to be attached to the parachute cushion. The whole assembly is fastened securely to the parachute.

INHALER WITH A POCKET CLIP IS CARRIED LIKE PEN

Equipped with a pocket clip, an inhaler which also can be used for spraying the nasal passages is carried conveniently like a fountain pen. If an inhalant is used, a glass vial is filled to the inhalant level at which a saturated air solution is allowed to come in contact with the nasal passages. For spraying, the container is filled to the spray level where a saturated vapor is disseminated. From a nasal guard the vapor or spray passes into the throat and nose in a natural way without any need for mechanical forcing, it is claimed.



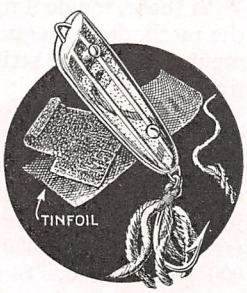
Gun with Spotlight Attached to Barrel to Illuminate Target When Shooting at Night

ACCURACY IN NIGHT SHOOTING IMPROVED BY LIGHT BEAM

Accuracy in night shooting is greatly improved by a sighting attachment for firearms in the form of an electric spotlight. This light automatically illuminates the target as the gun is pointed and the shooter takes aim. It is intended particularly for police assigned to night work.

FISH LURE CAN BE TAKEN APART TO CHANGE COLORING

Designed so that its color may be changed with little effort, a new type of trolling or casting lure is available to the fisherman. The plug is made of two halves of a transparent, magnifying material, fastened together with a clamping device that permits the plug to be opened. The design or coloring material is a thin sheet of foil, paper or cloth placed between the transparent halves. A stainless steel link extending between the two halves lengthwise provides a means of changing the hooks or leaders when the bait is opened.



METALS more costly than JEWELS

Left, Heating Pellet to Form Solid Metal; Right, Treating Infection with Ultra-Violet Radiations

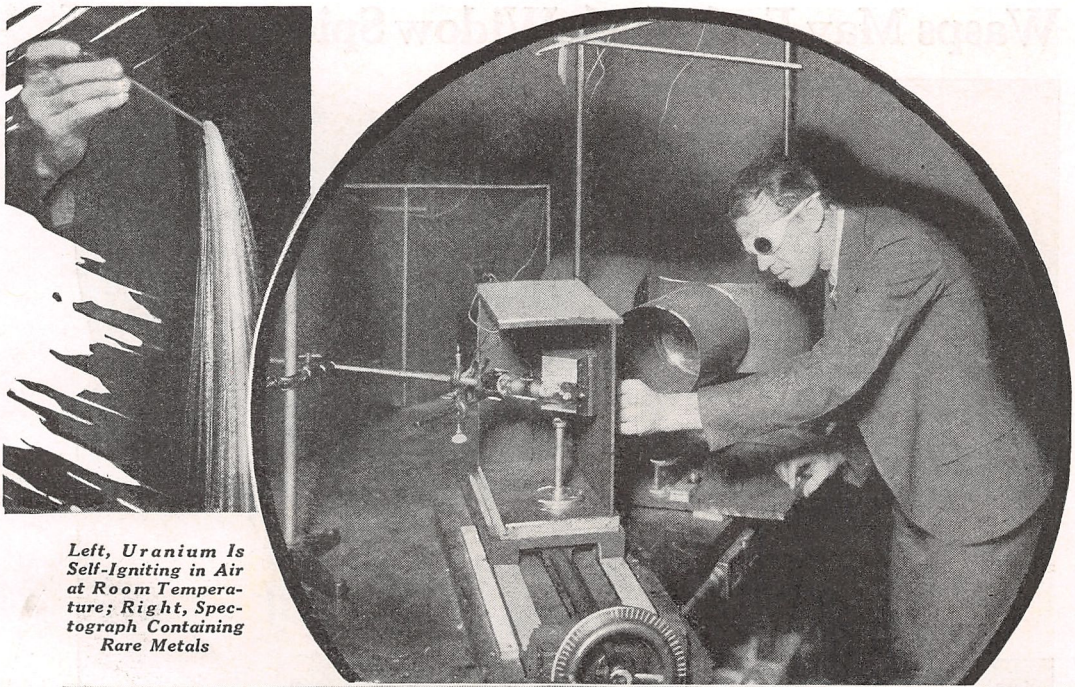
LITTLE did Michael Faraday dream in 1800 that, in propounding the theory of electro-magnetic force, he was sowing the seeds for a vast development in the twentieth century. Or, that electricity was to usher in a new "Age of Metal" in which rare elements were to be isolated and harnessed.

For more than a decade now, rare metals have given us the incandescent lamp, the X-ray tube, the photo-electric cell. With these, medical men have so improved the methods of diagnosis and health treatment as to make strides in the prolongation of human life.

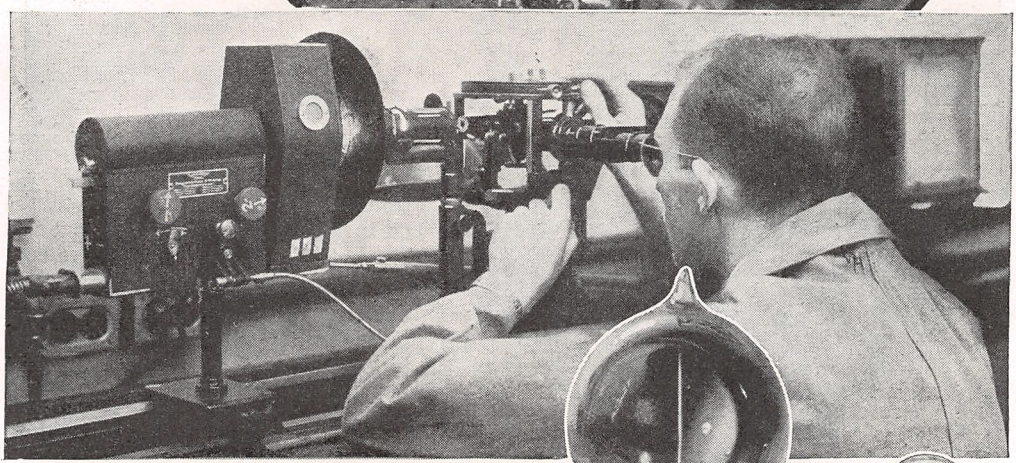
Like diamonds, metals are classed as "rare" because of their scarcity. When first isolated, some of these metals are many times more costly than the rarest of jewels. Less than ten years ago, rhenium was valued at $10,000 per gram, or $4,500,000 per pound. Since then, increasing usage has brought its value down to $3,375 per pound, but it still dwarfs the $560 a pound for gold. The great cost is due to the fact that it takes 1,000,000,000,000 parts of the earth's crust to produce one part of this metal.

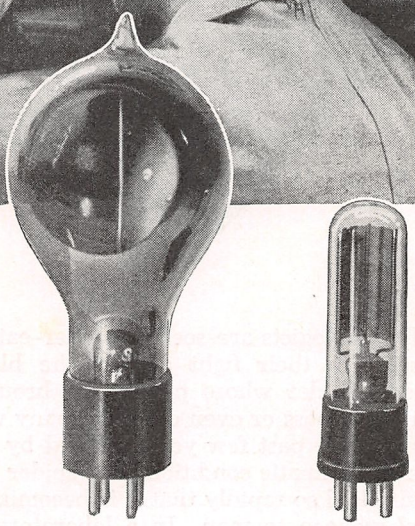
A metal remains rare only so long as its usage is limited. A pound of aluminum once sold for $25. Tungsten, the heart of the electric lamp, is still regarded by many as a rare metal, because a generation ago it was scarcer than gold. Now it is consumed by the thousands of pounds daily for electric lamps and high-speed steel.

"Isolating a rare metal is only a small part of the job," says Dr. John W. Marden, assistant director of research of the Westinghouse Lamp company. "Handling and



Left, Uranium Is Self-Igniting in Air at Room Temperature; Right, Spectograph Containing Rare Metals





fabrication to the ductile state where it can be worked into wire and combined with other metals to form alloys, is often the more difficult problem."

Some rare metals are more temperamental than our touchiest prima donnas, requiring the greatest of diplomatic finesse before they will submit to the whims of the research metallurgist.

"Uranium, the heaviest of all metals, is a good example," adds Dr. Marden.

"As a fine powder, it is highly inflam-

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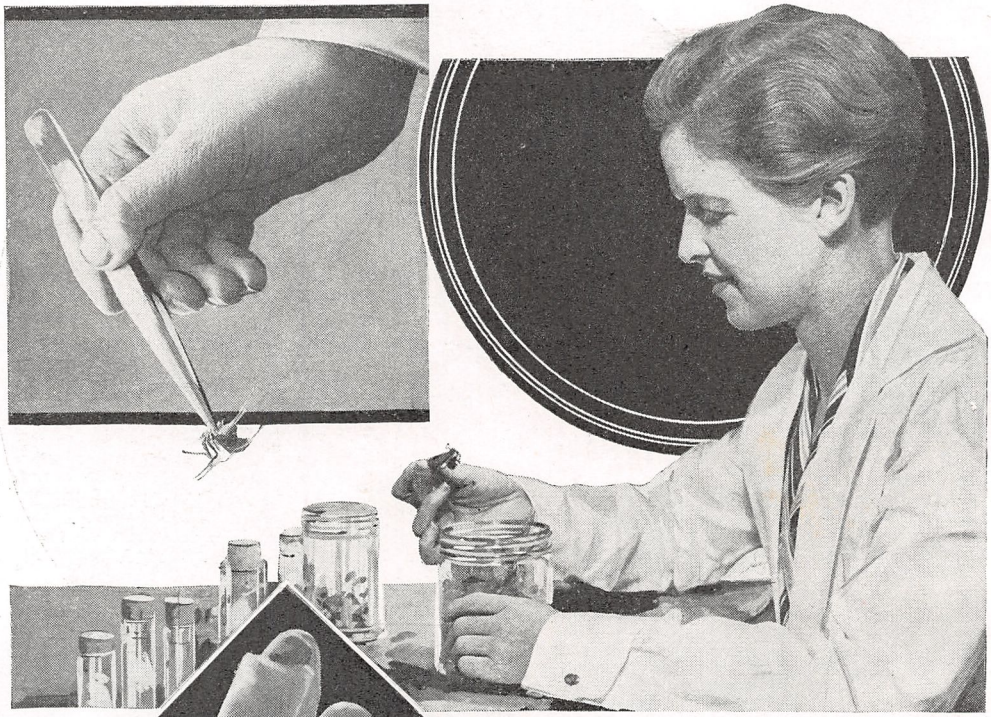
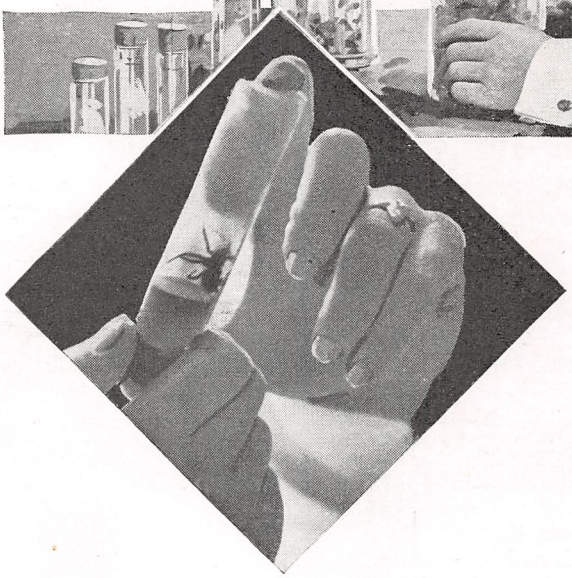
Center, Observing Crystalline Structure of Rare Metals; Bottom, Two Types of Westinghouse Photo-Cells in Which Rare Metals Play Important Part

Wasps May End Black Widow Spider Menace



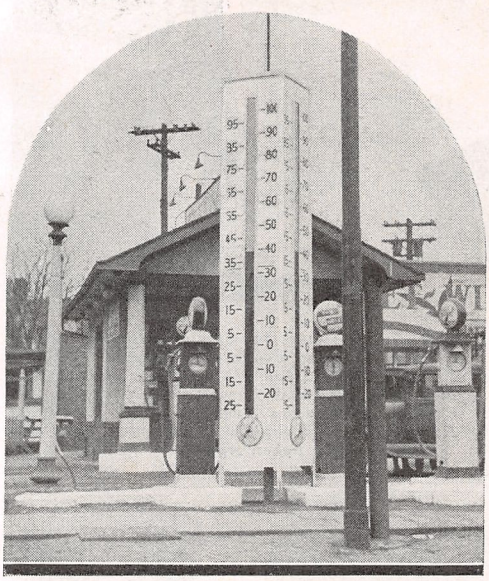
Laboratory Worker Handling Poisonous Black Spiders While Studying Their Habits



Entomologists are seeking spider-eating insects in their fight against the black widow spider whose poison has brought serious illness or even death to many victims in the past few years. Aided by favorable climatic conditions, the spider has multiplied so rapidly that it is becoming a real menace to man. In a laboratory at the University of California, these spiders are being studied by raising many generations of them in electrically regulated incubators in which the cocoons are hatched and the whole life cycle is studied. The creatures are handled with gloves and tweezers. It has been discovered that certain types of wasps are natural enemies of the black widows. Two kinds have been found to lay their eggs in the cocoon of the spider and to hatch out parasites which devour the baby spiders. If the parasites can be raised in large numbers, they may be widely distributed to feed on the spider cocoons, thus holding in check the black widow. The virus of the black widow, weight for weight, is more deadly than the poison of the rattlesnake but such a small amount is injected that death is infrequent although a person may be ill for weeks or even months. The only known remedy is a serum recently developed which helps to combat the effects of the poison.

WEATHER-WARNING INDICATOR USED BY OIL STATION

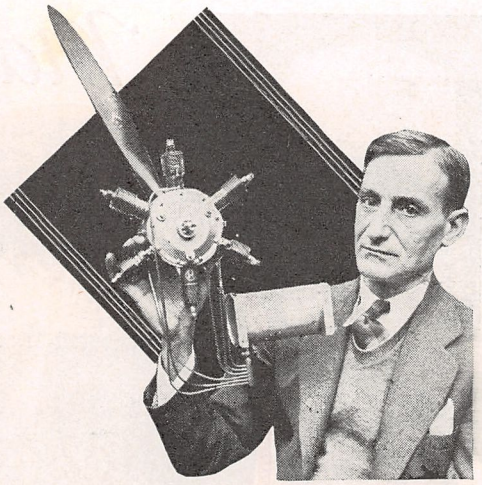
One Cleveland, Ohio, oil station increases its winter business with the aid of a large cold-weather indicator to advise motorists of a drop in temperature and the need for anti-freeze and caring for oil, grease and battery. The indicator is in the form of a sixteen-foot thermometer with two sides, made from two thirty-inch panels of wood painted white and with black figures. The "mercury" column is made of oilcloth set beneath isinglass. The lower portions of the oilcloth strips are painted red and the upper parts are white. The oilcloth is wound on rollers mounted at the top and bottom of the boards. A spring window roller is used and by jerking the tape, the roller functions as it does for a window shade, lowering or raising the red column. The second spring keeps the cloth taut. Readings from a real thermometer mounted near by aid in maintaining the correct temperature.



Filling Station's Weather Indicator with Oilcloth "Mercury" Column Wound on Rollers

MOTOR DRIVES MODEL PLANE AT HIGH SPEED

Developing five horsepower, a miniature motor weighing five pounds is capable of driving a model plane at seventy-five to 100 miles per hour. It will make possible

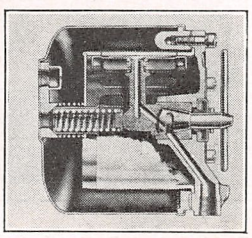


Inventor with Five-Pound Motor That Can Drive Plane with Fifteen-Foot Wing Spread

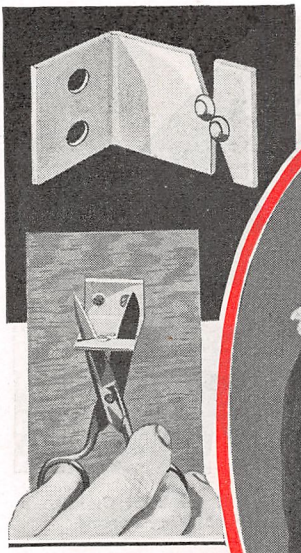
a radio-directed plane of fifteen-foot wing spread, since that size craft is large enough to carry a radio receiver to pick up remote-control signals. The motor is a six-cylinder, two-cycle engine and is connected to a thirty-inch propeller. The power is sufficient to keep a glider aloft without aid of the wind.

SELF-CLEANING OIL FILTER NEEDS NO REPLACEMENTS

Replacement of the oil filter is said to be eliminated by the introduction of a self-cleaning filter. Turning a handle causes the filter to eject sludge collected from the oil. The element is a heavy brass cage with an extremely fine machine thread cut around the outside. This thread is the locating groove in which is wound one long space of tinned steel wire. A tiny space of only two and one-half thousandths of an inch between each coil is the "mesh" through which the oil is filtered. Sludge and abrasive matter are collected on the inner surface of the mesh. The filter is cleaned, while the engine runs, by turning a handle, causing a reverse flow of oil under full pressure to flush out the sludge.



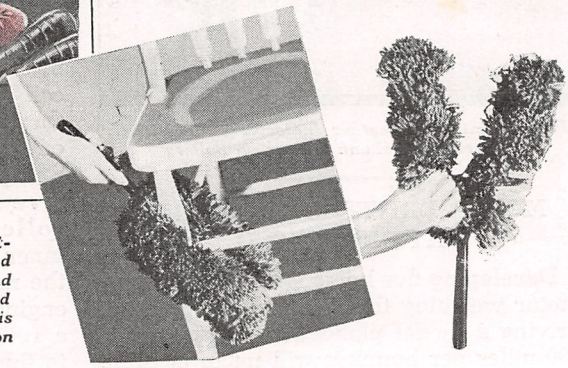
Making HOME



Above, Double-Acting Scissors Sharpener Designed to Eliminate Sharpening One Blade at a Time; Wall Holder Has Two Sets of Revolvable Steel Wheels; by Working the Scissors Up and Down in Holder, the Wheels Dress Each Blade Uniformly

Left and Below, Latest Mixer Speeds Up Cooking; Guard Prevents Splashing; It Is Designed to Lift Mixture and Allow Air to Mix Freely with It Before Returning It to Container; the Device Is Adaptable to Any Size and Shape of Container; One Feature Is Easy Cleaning

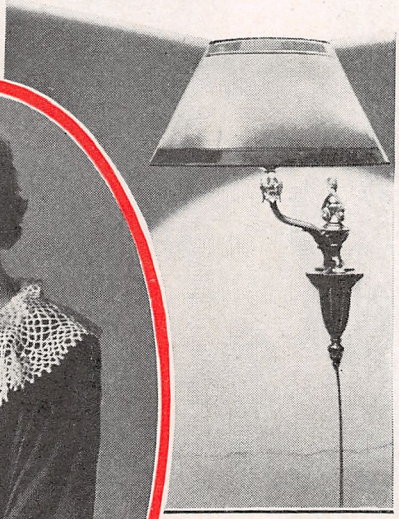
Left, Latest Device for Straining, Draining, Ricing and Washing Foods and Vegetables; Roller Type Pestle Crushes Whole Fruits and Vegetables; Two Six and Three-Quarter Inch Bowls, Coarse and Medium Mesh, Give Wide Working Range; Although Rigidly Constructed, the Press Is Easily Taken Apart for Washing



Right, Latest Duster Is Spliced to Make Dusting Easier and to Facilitate Cleaning Plain and Fancy Carved Tables and Chairs; Rungs and Backs of Chairs and Legs of Tables Are Cleaned and Polished Quickly with Little Effort; This Device Makes It Unnecessary to Get Down on Hands and Knees to Dust the Furniture

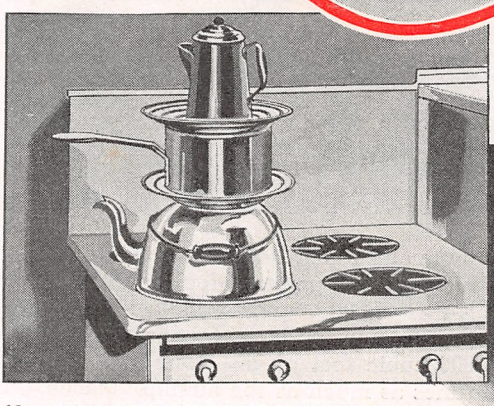
TASKS *a* PLEASURE

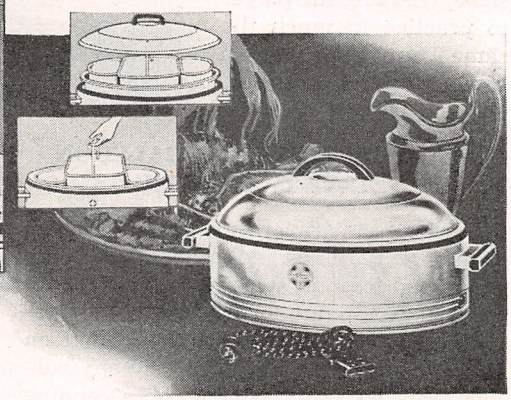
Below, Screw-On Nipple for the Baby's Bottle Is Easy to Put on; Only a Twist of the Fingers Is Necessary, Even in the Dark; the Nipple Is Sanitary, Since the Fingers Never Touch the Inside of Nipple Nor the Neck of the Bottle; It Cannot Be Removed by the Baby



Above, "Pin-It-Up" Study Lamp Which Can Be Hung over Desk or Study Table; It Gives Thirty Foot-Candles of Light as Specified by Science; Opal Glass Diffuser Softens Light

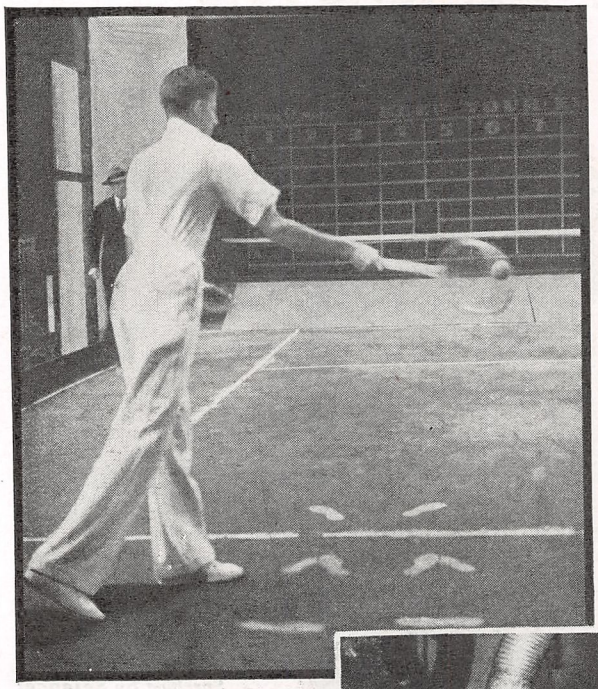
Oval, Left, Glass Top for Home Canning Is Sealed in Place by Rubber Gasket After Air Is Exhausted by Hand Pump; Hole in Center of Top Is Covered with Small Rubber Cup; When Rubber Shoe of Pump Is Placed on Top, Air Is Sucked from under the Cup, Sealing Hole; Below, Electric Roaster May Be Used for Roasting, Baking, Frying, Toasting and Even Canning





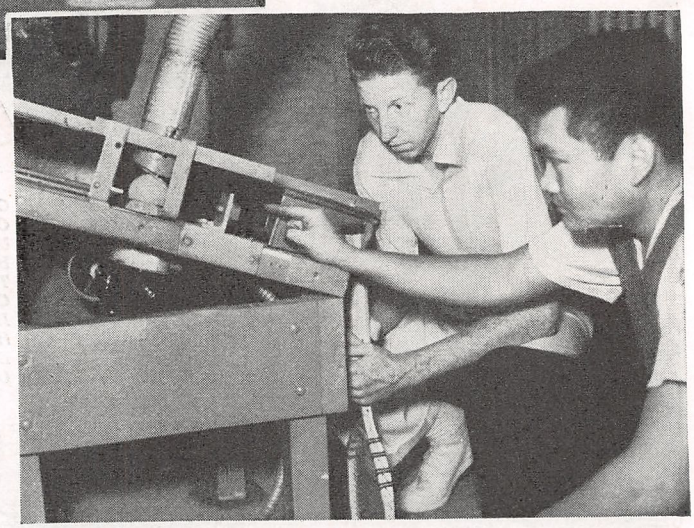
Above, Steamer Ring Converts Two Pans into Double Boiler; It Fits All Kettles; Arrangement as Illustrated Is Possible, Only One Flame and One Stove Eye Being Used; After Both Vessels Boil Separately, One Is Placed over the Other with Steamer Rings between

Tennis Robot Tosses Balls for Practice Shots



Player Returning a Service by the Tennis Robot, and the Mechanism Which Tosses Out Balls for Practice Shots

Tennis players can practice without bothering to find someone to serve if they are equipped with a robot which actually is a mechanical tennis player. The device delivers various types of shots, enabling the player to practice in much the same manner as though a companion were serving.



ALTITUDE LIMIT FOR BALLOON IS SET AT TWENTY MILES

If man is to travel into the sky higher than twenty miles, he probably will be compelled to go in some rocket-parachute device. Computations based on the experiences of recent stratosphere balloon flights indicate that it is unlikely any balloon can be built capable of ascending 100,000 feet. The official altitude now is 61,237 feet made by Lieut. Com. T. W. G. Settle and Maj. Chester Fordney, although a Russian balloon has an unofficial record of 72,000 feet. The problems faced in going much higher become most complex. As the balloon is made larger, weight is increased. As height increases, more ballast must be carried to get it back to earth. And at great heights in the stratosphere, the temperature gets warmer instead of colder, and this complicates matters. While a balloon capable of a maximum altitude of 75,000 feet would need to weigh about 5,300 pounds, carry 2,100 pounds of ballast, have a diameter of 179 feet and a gas capacity of 3,000,000 cubic feet, one capable of a maximum altitude of 100,000 feet would need to weigh 22,300 pounds—four times as much—carry 7,600 pounds of ballast, be 373 feet in diameter and have a capacity of 27,300,000 cubic feet of gas—four and one-half times as much as the airship "Macon." It has been suggested that if the ballast carried were liquid hydrogen, it might serve in liquid form as ballast and in gaseous form to increase buoyancy.

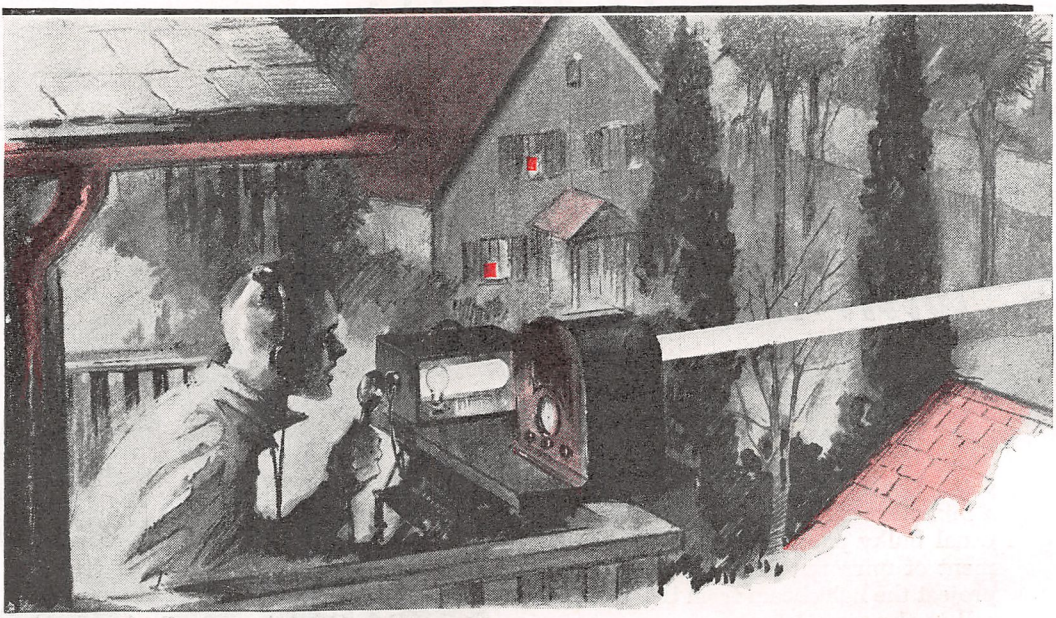
FILM TELEVISION *with Mirrored Lenses*

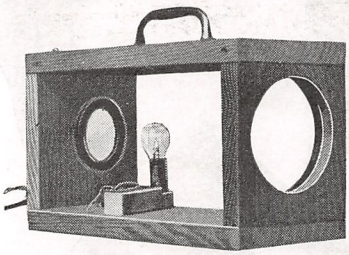
BRILLIANTLY illuminated 10 by 12 in. television pictures, of real entertainment value, have been demonstrated recently by Mr. William H. Peck of New York City. The main features of the system are a miniature Kerr-cell, which replaces the usual bulky photo-cells, and an arrangement of mirrored lenses that project the light beam from the cell to the viewing screen.

Standard-size movie film is employed in transmission, a special high-speed motor being used to provide 24 pictures per second. Vertical scanning is obtained by the continuous motion of the film, while horizontal scanning is performed by means of a disk containing many glass lenses, each mirrored on the rear surface. The light source is an ordinary auto headlamp placed within a collecting lens which directs a brilliant beam to the rotating lens disk. Sixty-line transmission was used in the demonstration; this can be increased easily by speeding up the scanning wheel.

Above, Transmitter with Amplifier; Below, Receiver and Miniature Kerr-Cell; Left, Receiving Disk and Cast-Glass Lenses

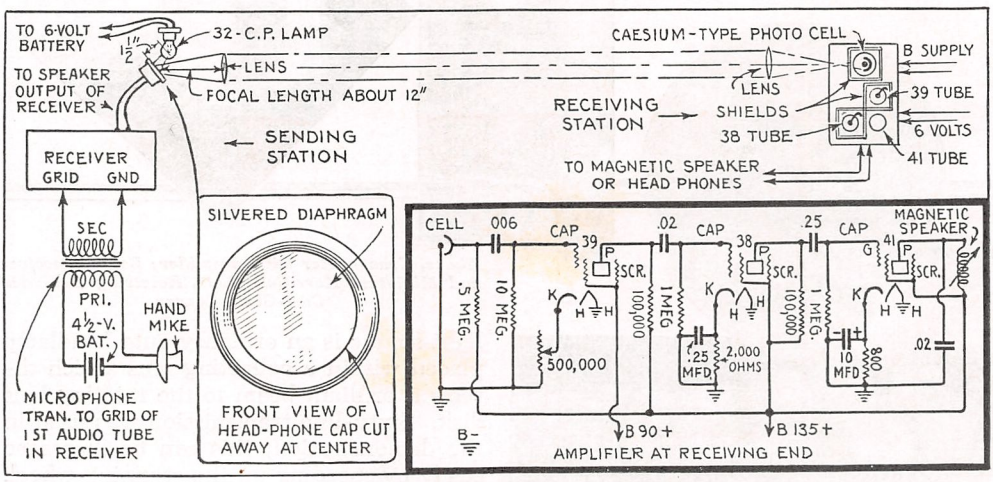
How to Chat Over





By FRANK S. PEARNE

ANYONE can assemble the simple parts necessary to talk over a light beam. Ever since the days of tin-can telephones, experimenters have been interested in various methods by which they could communicate with each other over short distances. Wire-line telegraph and visual signaling by mirror or lamp, all require a knowledge of code while a modulated beam of light may be used to carry the voice over



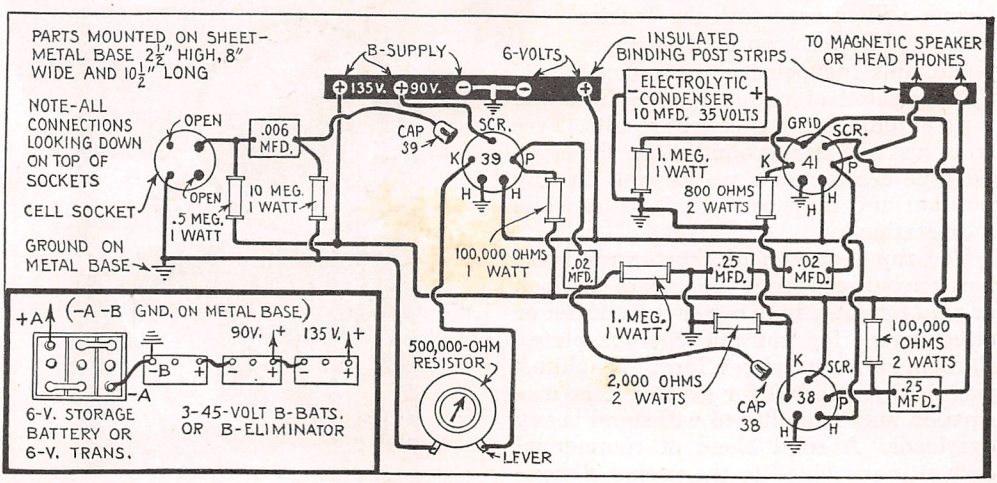
a LIGHT BEAM . . .

distances up to about one-half mile, and no code is required.

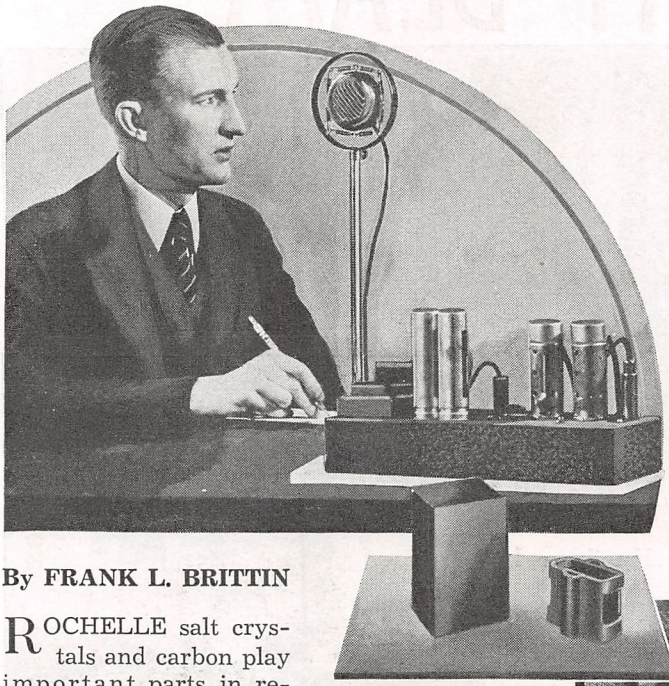
This system to be described has given excellent results, and most of the parts will be found in the average experimenter's junk box. Very few extra parts are necessary at the sending end; a hand microphone is connected to your regular broadcast receiver in a manner similar to that used in home broadcasting stunts for breaking into programs with personal announcements. However, instead of connecting the microphone directly to the audio amplifier in the receiver, a separate microphone transformer and a small 4½-volt battery are used as shown in the diagram of the sending station. A Na-Ald home broadcaster adapter for the 1st audio tube socket in the set will simplify the connections to grid and ground.

The best type of broadcast receiver for the purpose is one that employs a speaker

(Continued to page 114A)



Crystal Microphone and Carbon Plate Tubes



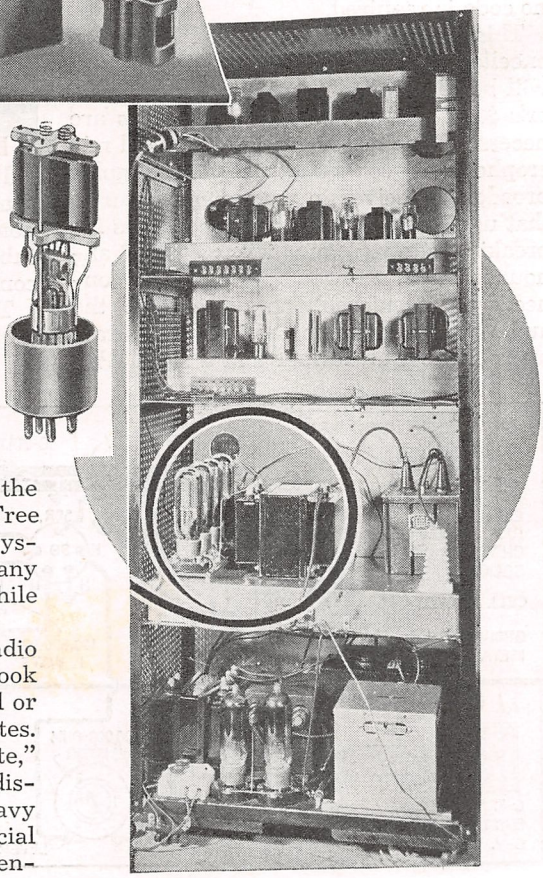
By FRANK L. BRITTIN

ROCHELLE salt crystals and carbon play important parts in recently developed radio apparatus. The crystal microphone makes good use of the electrical properties of a rochelle salt crystal and requires no energizing current of any kind. It may be worked directly into an amplifier tube of a public-address system, or speech amplifier of an amateur transmitter, without the usual matching transformer. When used with the Turner line amplifier, shown in the upper photo, this inexpensive microphone was operated at points remote from the main amplifier with excellent results. Free from hiss and background noise, the crystal-type microphone works well in any position and may be moved about while in operation.

The rapid growth of short-wave radio has encouraged tube engineers to look around for something better than nickel or other metals for transmitting tube plates. Carbon, or in its purer form "graphite," was finally selected for greater heat dissipation and its ability to withstand heavy overloads. A solid block of commercial carbon is machined to the proper dimensions and is then mounted on the stem as shown in the photos at center.

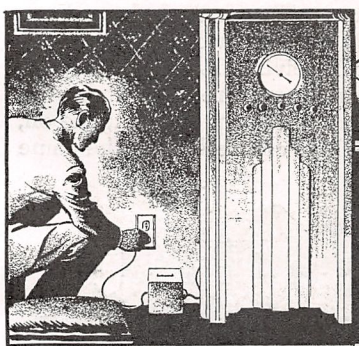
As the non-warping carbon plate is stronger mechanically than the usual metal plates, the completed tube will stand rough handling. At the present time, the R.C.A. Radiotron and Sylvania carbon-plate tubes are of the types usually employed in transmitters and public-address systems; however, the same principles apply to receiving tubes and these may follow later. Stabilized tubes

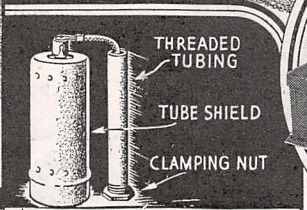
(Continued to page 120A)



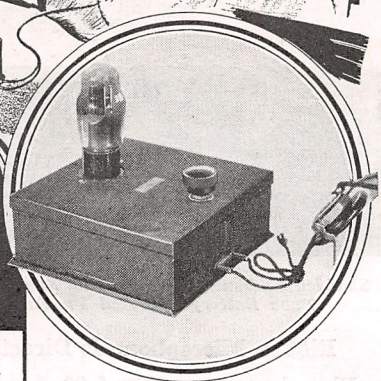
PRACTICAL RADIO SUGGESTIONS

Right, Code Practice Set Uses a Type-30 Tube as Audio Oscillator for Good Clear Signals; Four Flashlight Cells, Which Fit Inside the Case, Supply Filament and Plate Current; Below, Line-Noise Filter for All-Wave Receivers, Eliminates Interference in Short-Wave and Broadcast Bands; These Filters Are Necessary Where Background Noise Persists Due to Line Conditions

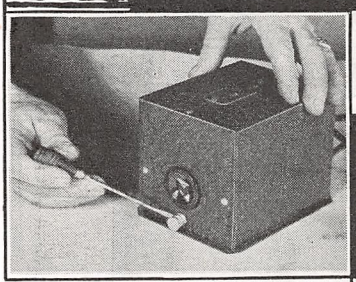


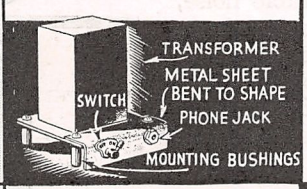


Above, Threaded Brass Tubing Makes Good Shield for Screen-Grid Tube Lead

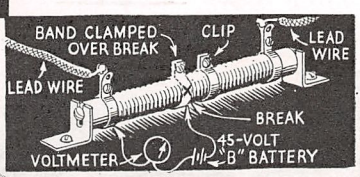


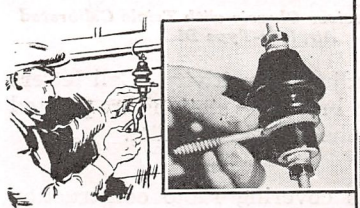
Left, Compact Transformer Assembly Saves Space in Portable Receivers or Transmitters; Room Is Provided on and under the Base for Mounting Jacks, Switches or Variable Resistors, Enabling the Builder to Keep Leads Short for Best Results; Shielding Is Simplified as Parts Are Grouped



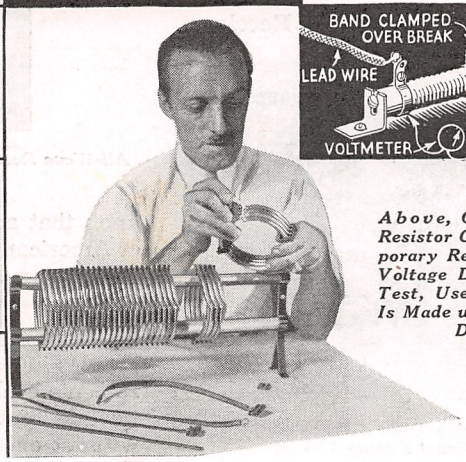


Below, Easily Installed Gap-Type Lightning Arrester Is Housed in Porcelain Container so Designed That Snow and Ice Cannot Collect on Surface to Cause Signal Loss

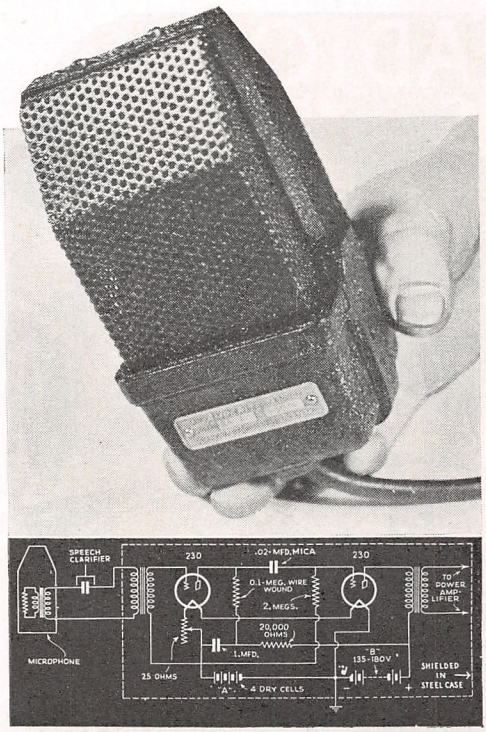




Right, Single Adjustable Transmitting-Coil Unit Covers All Short-Wave Bands; Divided into 4-Turn Units, Each Unit and Individual Turn Is Joined by a Removable Clip



Above, Ordinary Adjustable Resistor Clip for Handy Temporary Repair on Burned-Out Voltage Divider; Voltmeter Test, Used to Locate Break, Is Made with the Line Supply Disconnected

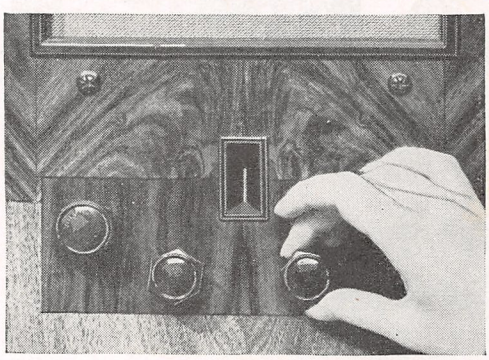


Shielded Ribbon Microphone and Suggested Two-Tube Battery-Operated Pre-Amplifier

Ribbon Microphone Is Directional

Placed at an angle of 90 degrees from any near-by source of undesirable noise, this directional ribbon-type microphone reduces the interference to a minimum and also helps to eliminate acoustical feedback. It employs a ribbon of aluminum alloy and is not affected by temperature.

Light Column Aids in Tuning Receiver

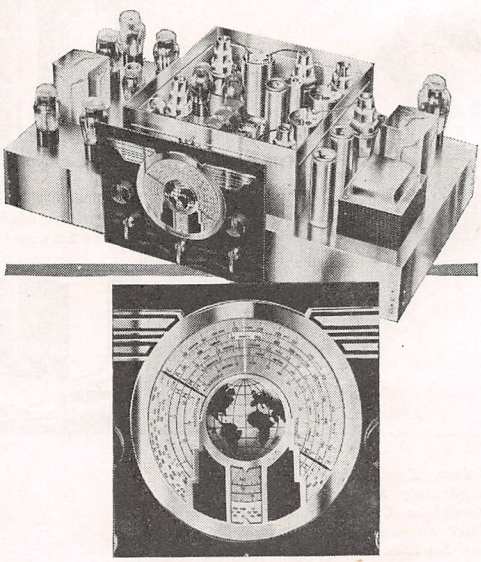


Control Knobs Showing Light Column at Center for Visual Tuning

Accurate tuning by means of a column of green light is a feature of one of the new English receivers. A small glass tube, about an inch long, and resembling a thermometer in appearance, is located in a panel escutcheon directly below the speaker grille. Medium and long wavelength tuning scales appear elsewhere on the panel. As a program is tuned in, the column of light rises to maximum height when the station is accurately located.

Sixteen-Tube Set Covers Five Wave Bands

This multi-tube all-wave receiver brings in ultra-short, short, medium, broadcast and long waves. The controls have been simplified so that only two knobs need be adjusted for receiving American broadcast programs. There are no switches on the back or bottom of the cabinet; the on, and off, switch is controlled by the same



All-Wave Receiver Chassis with Triple Calibrated Airplane-Type Dial

knob that adjusts sensitivity. Call letters of American broadcast stations are printed directly on the illuminated dial.

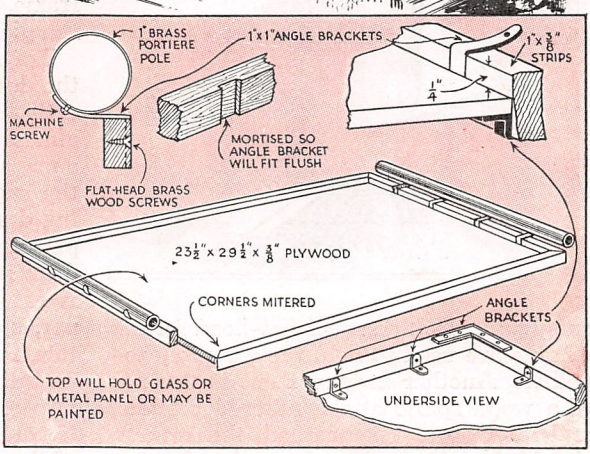
Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; when material lists are not included in the articles, these are available without charge on receipt of postage.

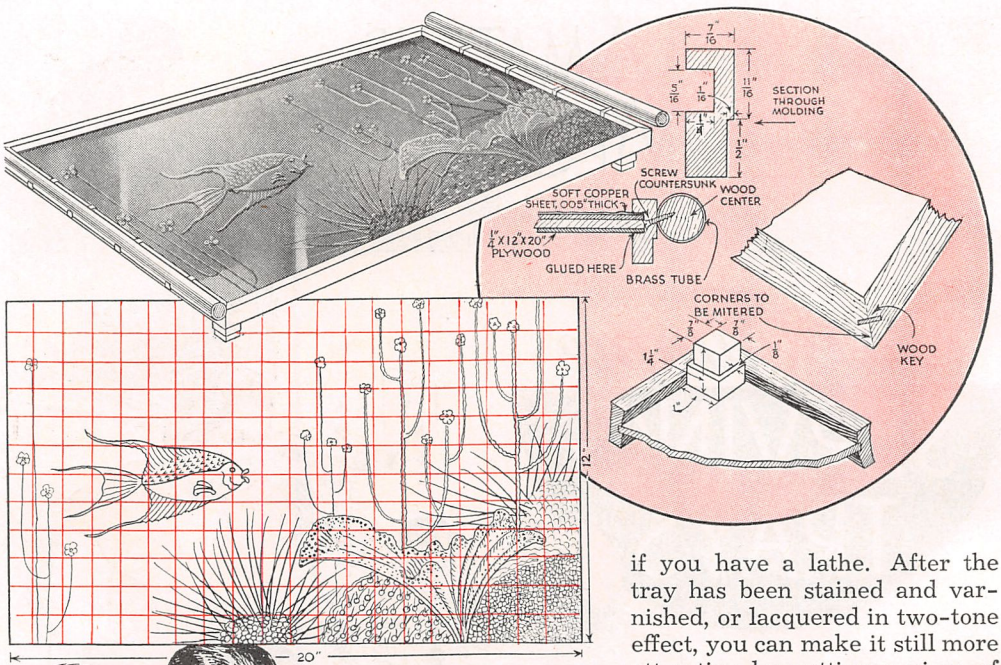
AMATEUR MECHANICS

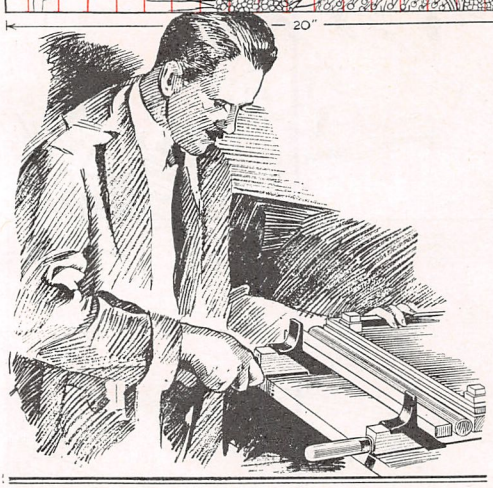
Two Simple SERVING TRAYS

By
OSKAR J. W. HANSEN

SIMPLICITY is the keynote in the construction of two kinds of serving trays described in this article. In the first one, detailed on this page, the bottom is a piece of plywood of suitable size, which fits inside of a frame, mitered at the corners. Small angle brackets are used on the underside of the bottom to hold it securely to the sides. Larger angle brackets are mortised in the end members of the frame to hold the hand grips, which are pieces of 1-in. brass portiere poles, available at almost any hardware or department store. You will note that the angle brackets are mortised so that they will fit flush. The ends projecting horizontally are bent over slightly to fit the contour of the hand grips. While flat-head brass wood screws are used to attach the angle brackets to the frame, machine screws are used to attach the brackets to the hand grips, the latter being drilled and tapped for the screws. Another detail of construction is the method of reinforcing the frame with corner braces, which is necessary to keep the mitered corners from spreading apart. As these pieces of metal will scratch a finished surface, it is a good idea to glue a piece of felt over them, or to drive rubber-head tacks into the underside of the frame to raise it. If desired, you can eliminate the use of angle brackets to hold the tray bottom to the frame, by rabbeting the frame so that the tray bottom fits



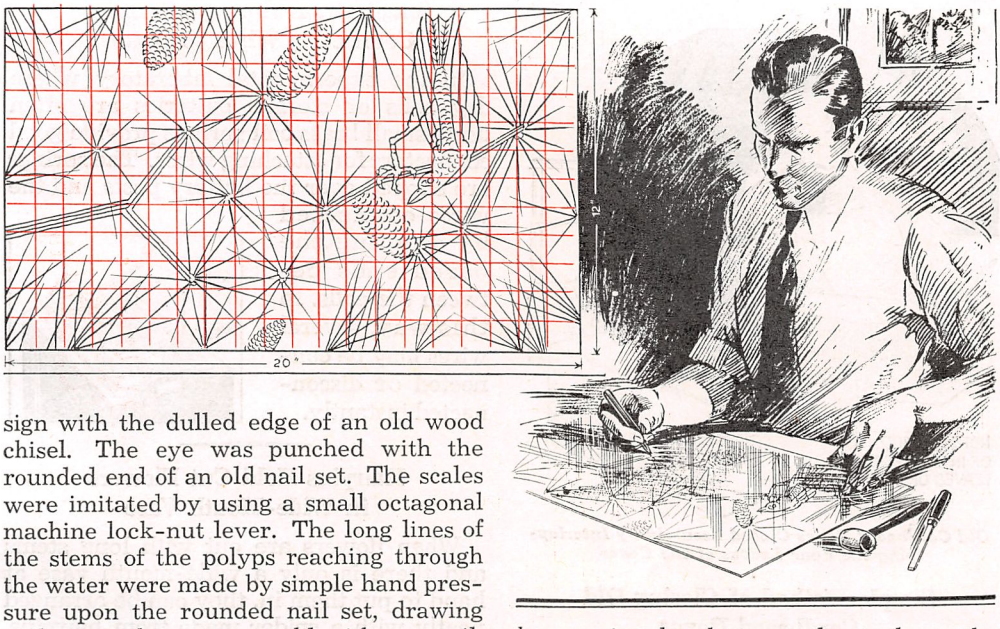




snugly, after which small flat-head screws or glue are used to hold the assembly together. Another improvement is the use of a wood spline at the mitered corners, and if you use this method, the corners should be glued. The brass hand grips should be polished bright and given a coat of transparent metal lacquer to prevent them from tarnishing quickly. A satin finish can be obtained by using No. 3-0 sandpaper, holding the sandpaper in the palm of one hand around the tubing and then twisting the latter. Of course, such a finish can be accomplished in much less time if you have a lathe. After the tray has been stained and varnished, or lacquered in two-tone effect, you can make it still more attractive by cutting a piece of fancy-design wall paper to fit the tray, and then placing a piece of glass over this. If you use plate glass for this purpose, its thickness should be taken into consideration when the tray bottom is fitted in the frame, as the frame should project above the glass.

Trays having hammered-copper tops, the design in pleasing repousse, are really artistic as well as practical. You can use almost any suitable design obtained from a magazine or newspaper, or you may like the suggestions given in the accompanying drawings. Just take a sheet of heavy paper, rule it off in 1-in. squares, and then draw in the design. The pattern thus made is easily transferred to the sheet of copper, by means of carbon paper. In doing this, remember that the design should be on the back of the metal, as it is going to be pressed or hammered from the back. If your design has any lettering, this part of the work must be carefully considered. The sheet copper used should be about .005 in. in thickness, and it should be of the softest grade.

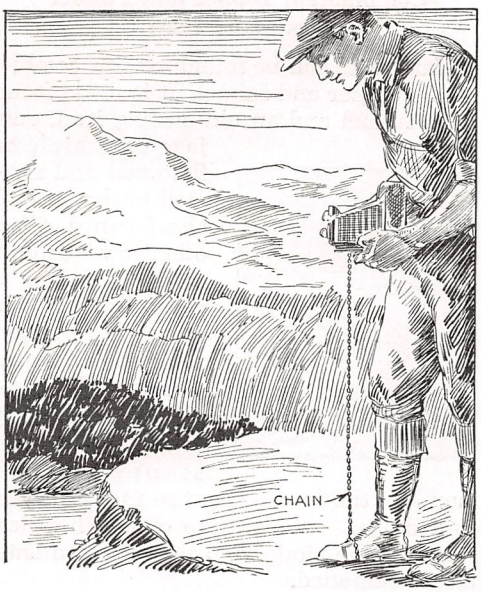
In the case of the tray illustrated the wooden handle of the mallet was used for making an indentation for the body of the fish in the soft copper. The outline of the fins and tail was then pressed into the de-



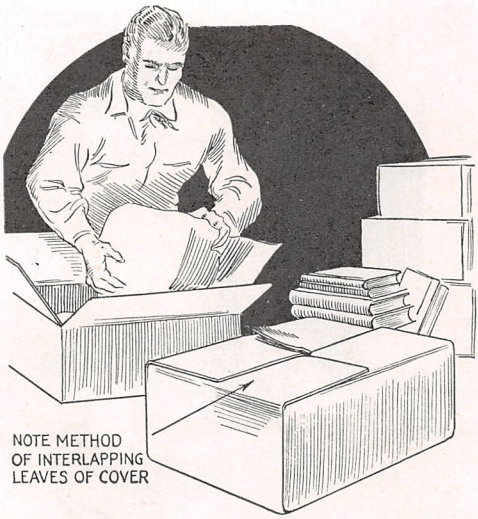
sign with the dulled edge of an old wood chisel. The eye was punched with the rounded end of an old nail set. The scales were imitated by using a small octagonal machine lock-nut lever. The long lines of the stems of the polyps reaching through the water were made by simple hand pressure upon the rounded nail set, drawing with it much as one would with a pencil. The coral formations were first pressed into general rounded form with the wooden handle of the mallet and then decorated afterward by gently hammering upon the small octagonal lock-nut lever. The star corals were made with the dull edge of a 1-in. wood chisel. It is important that the hammering be done gently, to keep the work in low relief. Distance is obtained in the picture by the different pressures one applies to the tools. A hardly visible line pressed into the copper will appear as an object far into the distance and a line or detail hammered with more vigor will show up as in the immediate foreground.

Length of Chain Serves as Substitute for Camera Tripod

When it is inconvenient to carry a camera tripod on an outing trip, a length of small chain that can be carried in your pocket will serve as a substitute. A tripod screw is fastened to one end of the chain for attachment to the camera. By keeping the free end of the chain taut with the foot while making an exposure, the camera can be held steady. If all exposures are made from about the same height, a loop may be formed permanently in the end of the chain to take the toe of the shoe. A better method, however, is to make a loop on one end of a length of wire, and then bend a hook on the other end. This may then be attached to any link in the chain to get the height desired.—Harry Starnes, Houston, Tex.



¶Plaster casts can be glazed by dipping them in a solution of water glass and then baking them in an oven.



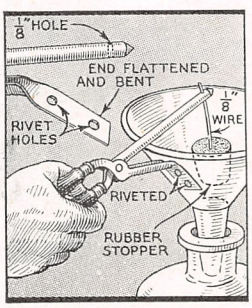
Old Cardboard Boxes Closed Securely by Interlapping the Four Leaves of the Cover

Simple Method of Closing Old Cardboard Boxes

When old corrugated cardboard boxes are used around the home for storing books, packages, etc., the four flaps of the cover can be fastened down by interlapping them as shown. This is better than using string, as the contents of the box are readily accessible without the trouble of untying and re-tying the package.

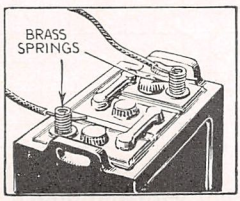
Combination Dipper and Funnel Has Many Uses

Many uses can be found for this combination dipper and funnel. It is made from a tin funnel and an old curling iron, one jaw of which is flattened and riveted to the side of the funnel. The other jaw is drilled near the end for a small wire which carries a rubber stopper. In use, the spring in the handles of the curling iron keeps the stopper in the mouth of the funnel spout so that it serves as a dipper, but pressure on the handles removes the stopper so that the contents may be emptied.



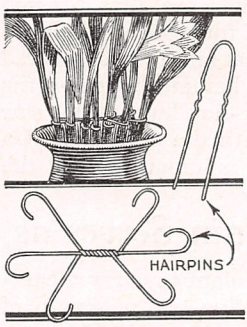
Small Brass Springs Facilitate Connecting Wires to Battery

In the experimental laboratory where dry cells or storage batteries are often used, small brass coil springs provide good connectors for attaching wires. The springs are slipped over the battery posts and the wires connected by slipping the bared ends between the coils. In this way, several wires may be connected or disconnected instantly.



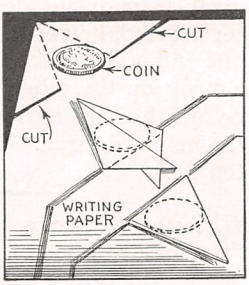
Hairpins Hold Cut Flowers in Wide-Mouth Vase

When flowers are cut with long stems and there is only a wide-mouth vase at hand to put them in, they can be arranged neatly with a spider made from hairpins. These are twisted together as shown, and the ends are bent to form hooks, after which the resulting spider is concealed within the foliage where the hooks engage the stems and prevent them from spreading apart.

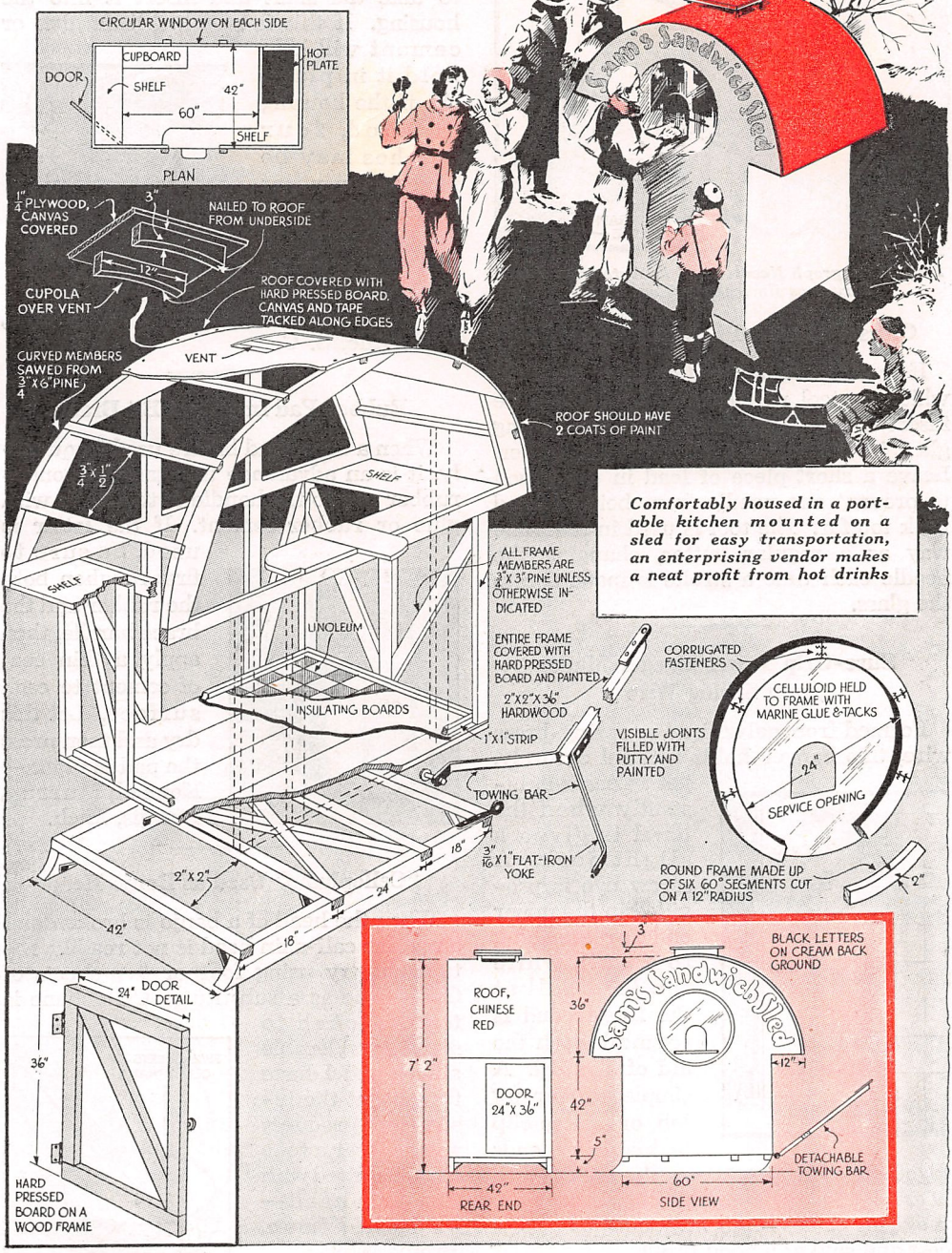


Mailing Small Coins Safely

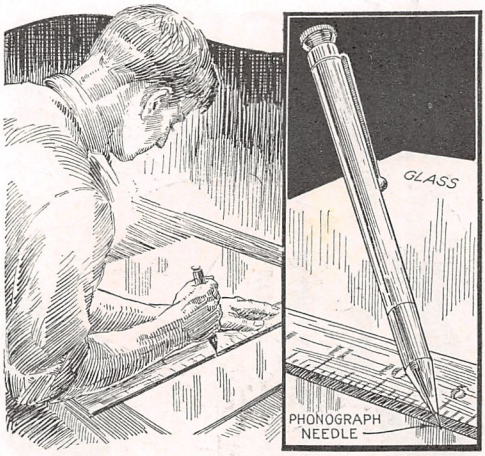
If small coins must be sent through the mail and no regular holder is available, wrap them in one corner of the letter as shown. In this way, when the letter is folded, there are two or three thicknesses of paper around the coins so that they are not likely to wear a hole in the envelope. This method also assures that the receiver of the mail will notice the coins as they are attached directly to the writing paper.



Novel WINTER KITCHEN *draws sandwich trade*



Comfortably housed in a portable kitchen mounted on a sled for easy transportation, an enterprising vendor makes a neat profit from hot drinks



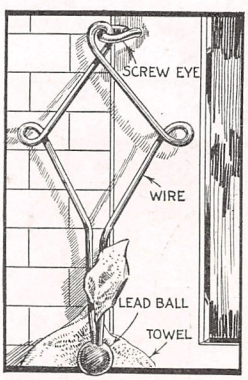
Steel Phonograph Needle Held in Automatic Pencil Serves as Emergency Glass Cutter

Glass Cut with Phonograph Needle

If you have an automatic pencil in which a steel phonograph needle can be inserted, it will serve as a tool for cutting glass in the absence of a regular cutter. Leave a short piece of lead in the pencil to prevent the needle from being forced back too far. The tool is used in the same way as a regular cutter, changing the needle each time a stroke is made across the glass.

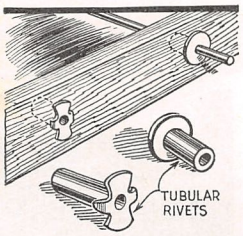
Sure-Grip Towel Hanger Made from Spring Wire

Formed from galvanized or spring-brass wire, this hanger holds a towel securely, yet releases it instantly when the towel is given a slight jerk. A screw eye is provided in the upper end for attaching to a wall, while the lead ball at the lower end is formed with the aid of a mold. A simple soldering job, or a wire clip to hold the ends together, will serve equally well. If a board jig is provided to form the hangers, they can be made up in quantities at low cost and sold at a good profit.



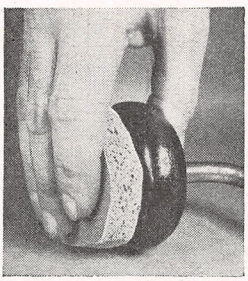
Tubular Rivets Serve as Bearings on Toys and Models

Tubular rivets of brass or copper provide a ready supply of bearings for toys and models. After selecting a rivet of suitable size, drill a hole through the head to take the shaft and insert it into the housing. If this is metal, a little glue or cement will help hold it in place. Or, if the housing is wood, four notches may be filed in the rivet head and two of the tabs formed in this way are bent over so that they can be driven into wood.—H. Reid Hearn, Greenville, S. C.



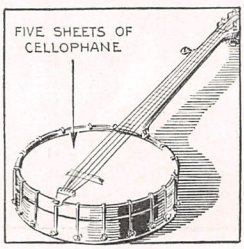
Rubber Pad Improves Bit Brace

When a brace and bit are used frequently, it is an advantage to attach a sponge-rubber pad to the handle of the brace with glue or rubber cement. If the latter is used, be sure to first roughen both the rubber and the brace handle, then apply a thin coat of cement to each surface. Let this dry and then press the pad in place.—Kenneth Murray, Sturgis, Mich.



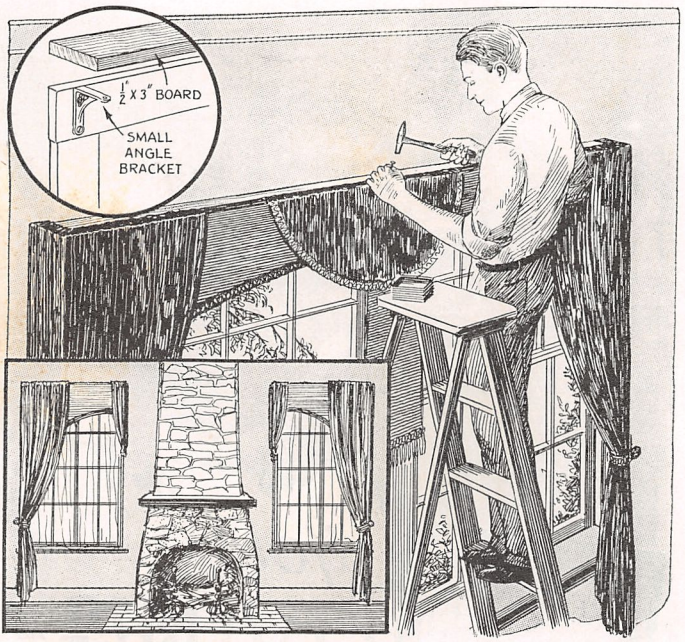
"Cellophane" Used as Banjo Head

When the head of a banjo is broken and a regular calf-skin head is not readily obtainable, try using four or five sheets of Cellophane as a substitute. Cellophane is tough enough to stand considerable abuse, and I have found that the instrument produces just as clear a tone as when fitted with a calfskin head.—John Hoffman, Bronx, N. Y.



Concealed Board Holds Window Draperies

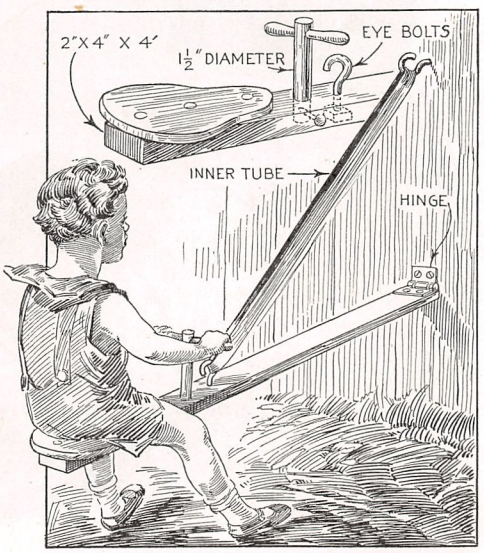
Some interior decorators are now using a board from which to hang window draperies. This is much less expensive than the conventional metal or wood pole, especially for tenants who have to cut up their decorative poles or purchase new ones when they move, as the arrangement of windows is usually different in each house. A ½-in. by 3-in. board is recommended and it is installed above the window on small angle brackets, which are available at any dime store. Tacks are used to fasten the draperies over the edge and around the ends of the board so that it is entirely concealed. Where two or three windows are together, one long board can be used with brackets at the ends and the center to give the necessary support. In two-window arrangements, the draperies may be hung the full length on one side of each window, festooned above each window, and continued about halfway down between the windows.



Concealed behind Window Draperies, a Narrow Board to Which They Are Tacked, Makes a Substitute for a Decorative Pole

Seesaw Fastened to Building Is Operated by One Child

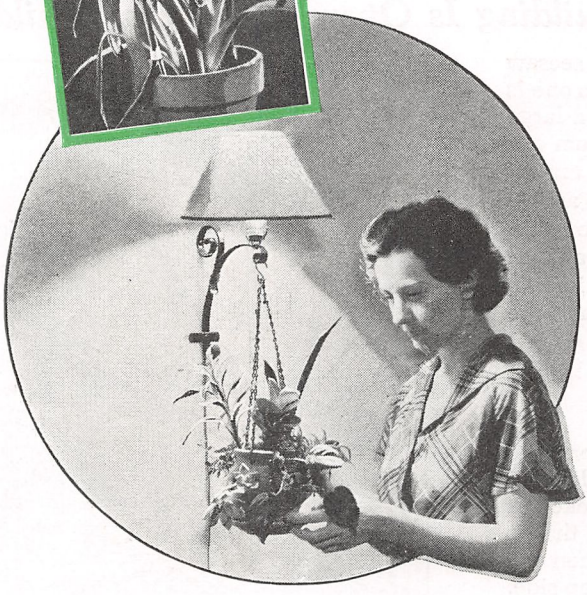
Differing from the usual type of seesaw in that one child can operate it, this one is hinged to the side of a building or a large post. It gets its teetering action from one or more old inner tubes or a coil extension spring, fastened to the seesaw and to the building by means of large eye bolts, which are opened to allow the band or spring to be attached. It is a good idea to close the eyes of the bolts so that the tubes will not slip off.



Cleaning Rugs Quickly

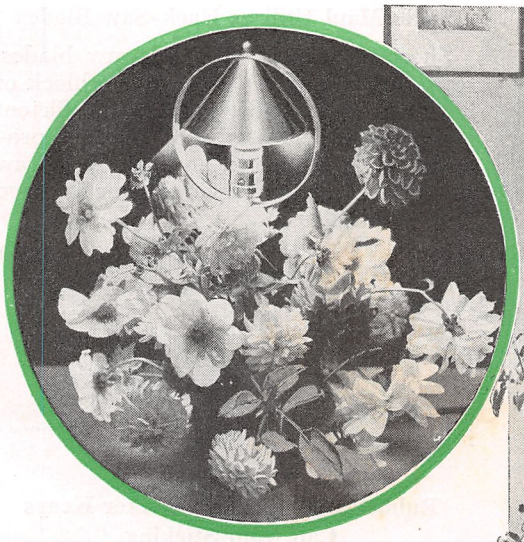
When beating a rug, turn it first face down and beat it on the back. This loosens the dirt which has gathered and packed in the coarse strands of the weave so that it will whip out of the nap readily when the rug is reversed and beaten on the nap side.

Your LIVING-ROOM



By
John Winters Flemming

MANY normal plants can be taken into the home, located at spots a considerable distance from the windows, and be kept in healthy condition for a reasonable length of time under 60 to 100-watt lamps, burning about five hours each evening. It is unnecessary to use special lamps such as sunlight or daylight lamps. Best results have been obtained from the ordinary electric lamp. The garden plot may be almost any container from an Easter flower basket to a regular floor lamp, from a flower pot to a strawberry jar. All that is essential is light and this light preferably should shine down on the plant from above so that the plant will grow upward to the light. Light shining on the plant from one side tends to draw the plant toward it, causing the plant to bend, sometimes to bend so far as to touch the lamp and burn the plant. As a usual thing, the foliage type of



Neat homemade fixtures with metal shades, assembled from parts of old lamps, may be used to light cut flowers or growing plants, giving a pleasing decorative effect

Above, this lighted plant fixture was made from a wrought-iron flower-pot stand and part of a floor lamp. Below, small lamps and reflectors spaced along basket handle

GARDEN

plants and vines requires lower intensities of light than the flowering type and the foliage type accommodates itself to indoor conditions more readily than the flowering type. For growing plants, at least 100-watt lamps are recommended.

Properly arranged, the beauty of your plants will, when combined with lamps, greatly enhance the attractiveness of your home. Flowerpot holders, suspended from wrought-iron wall lamps or forming part of a floor lamp, are exceptionally neat in appearance. Even an ordinary table lamp may be the center-piece of a wide, shallow bowl containing some of your favorite plants. The photos show how easy it is to arrange plants in such combinations. Another innovation is to arrange small electric lamps, fitted with suitable shades, to illuminate baskets or pots of flowers. The handle of a basket may serve as the support on which the lamp is mounted as in the lower right-hand photo. Other examples of this practice are shown at the top and left, the lamps being mounted on a pointed rod for easy insertion into the earth of the pots.

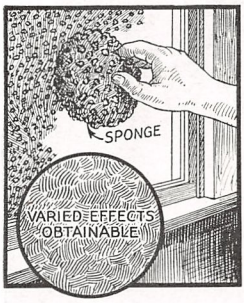
Patterns Made from Wire Solder Save Time When Bending Heavy Wire for Certain Jobs

Wire-Solder Patterns Simplify Bending Stiff Wire

When it is necessary to bend heavy wire for a certain job, it is often difficult to gauge the length and angle of each bend correctly, and time is lost in making adjustments. This may be overcome almost entirely if a model of the required shape is first made from wire solder and then used as a pattern in bending the wire. The solder bends easily and any inaccuracies are readily corrected.

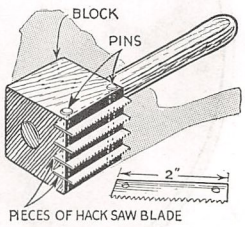
Frosting Window Glass with Paint

If there are windows in your home that should be frosted, apply paint to the glass and stipple it with a clean sponge. Any color of paint may be used, but it must be applied in a thin coat. Varied designs of stippling are possible, depending on how you handle the sponge. If you are not satisfied with the first attempt, go over the wet paint with a brush and try again. Or, still better, experiment on a scrap piece of glass until the desired effect is obtained.—R. Newell, Cranford, New Jersey.



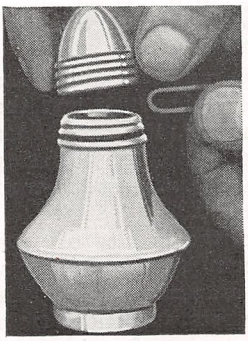
Steak Maul Utilizes Hack-Saw Blades

Short lengths of old hack-saw blades, set in grooves which are cut in a block of hardwood 2 in. wide, provide an efficient steak maul. The hardwood block is provided with a handle and the hack-saw blades are held in place by pins inserted through holes in the block and blades. It will be necessary to anneal the latter by heating and quenching them in water before drilling them for pins.



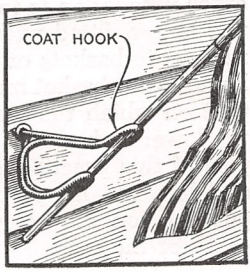
Rubber Band on Salt Shaker Keeps Cap from Sticking

Usually the caps on aluminum salt-and-pepper shakers must be screwed down tightly if they are prevented from loosening, which often makes it necessary to use a pair of pliers to remove them, and sometimes results in crushing the cap. This trouble may be avoided by slipping a short rubber band into the last thread on the shaker. The rubber will prevent the cap from slipping, yet allow it to be removed with the fingers.



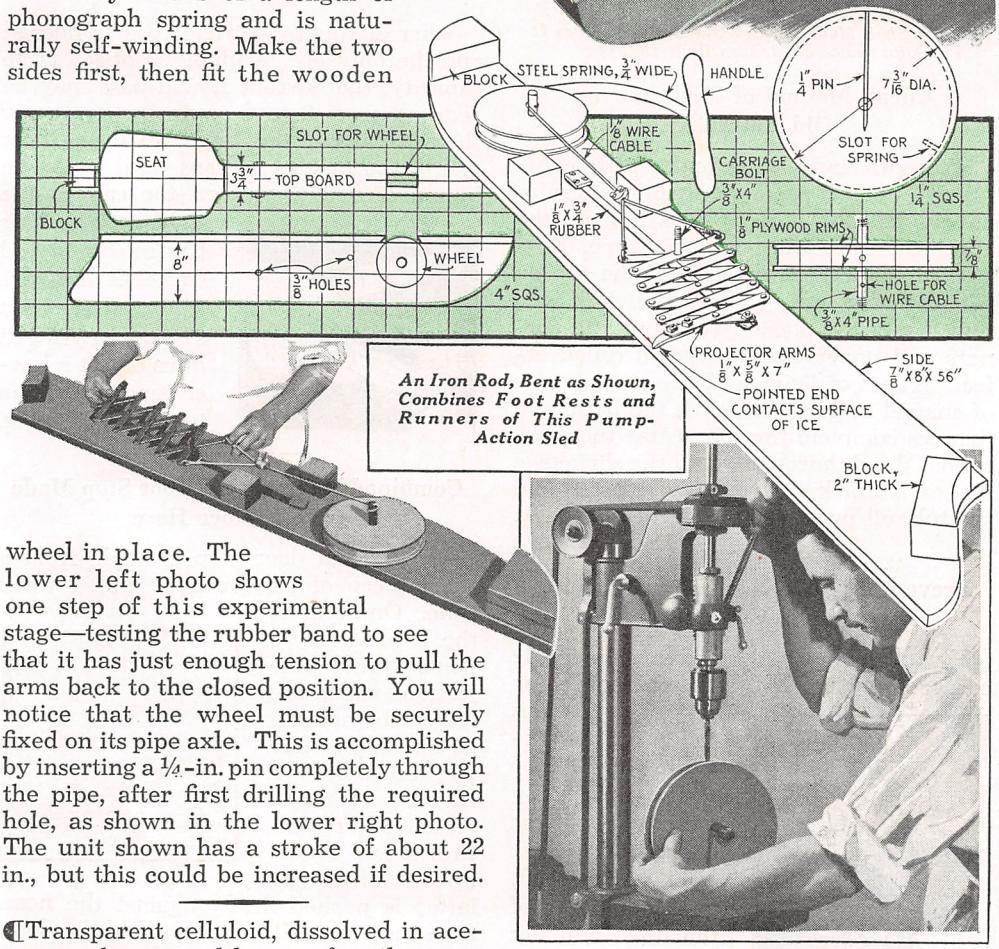
Coat Hook Serves as Flag Bracket

Instead of nailing the staffs of small flags to porch posts or the sides of a building, as is often done, screw wire coat hooks into the desired positions and then spread the prongs to receive the flag staffs as shown. The looped end of the upper prong should engage the staff snugly to prevent it from slipping.



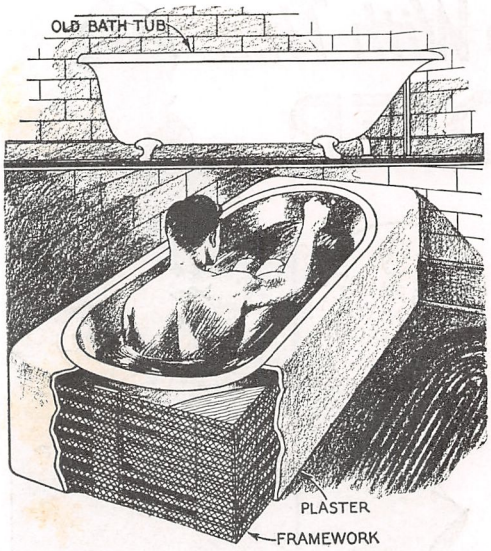
You Can Really Go With This ICE SCOOTER

FOR real fun—if you like the tang of a wintry air as you zip over smooth ice—build this speedy little ice scooter. An extension arm such as is used on telephones, is worked by means of cables so that the power stroke will force the sharp point on the end of the projector arm into the ice. A stout rubber band is fixed to the end of the projector and carried forward so that the mechanism will automatically return to a closed position at the end of each stroke. The drum itself is operated by means of a length of phonograph spring and is naturally self-winding. Make the two sides first, then fit the wooden wheel in place. The lower left photo shows one step of this experimental stage—testing the rubber band to see that it has just enough tension to pull the arms back to the closed position. You will notice that the wheel must be securely fixed on its pipe axle. This is accomplished by inserting a ¼-in. pin completely through the pipe, after first drilling the required hole, as shown in the lower right photo. The unit shown has a stroke of about 22 in., but this could be increased if desired.



An Iron Rod, Bent as Shown, Combines Foot Rests and Runners of This Pump-Action Sled

¶Transparent celluloid, dissolved in acetone, makes a good lacquer for silver.



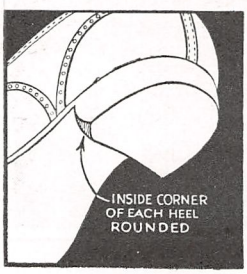
Plaster Shell Made around Old Bathtub Gives It Appearance of Modern Built-In Type

Cheap Method of Modernizing Old Bathtubs

With lath and plaster and a little careful workmanship, anyone can modernize an old bathtub so that it will have the appearance of a built-in apron type. First put a light framework around the tub on which to fasten wood or metal lath, and then apply the plaster, rounding the corners and upper edges to get a rolled effect. A coat of sizing and one or two coats of enamel or paint to match the bathroom fixtures complete the job. After the plaster has dried thoroughly and the shrinkage causes a crack between the plaster and the tub, oil putty is used to fill the crack.

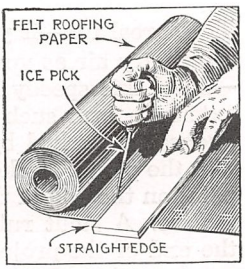
Preventing Shoe Heels from Catching in Trouser Cuffs

If you are annoyed by having the inside corners of your shoe heels catch in your trouser cuffs, round off the corners with a file or sharp knife. By removing just enough to prevent catching the cuff, the appearance of the heel will not be marred.



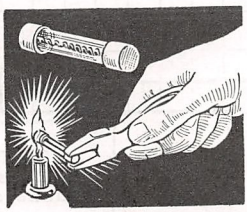
Roll Roofing Cut with Ice Pick

Instead of using a knife to cut felt or tar roofing paper and have the blade gum up, use an ice pick or similar pointed tool. Two or three strokes with the pick will cut through the paper, using a straightedge as a guide. If one side of the paper is sanded, cut from the smooth side to avoid dulling the point of the pick. —Earl E. Moffat, Hollywood, Calif.



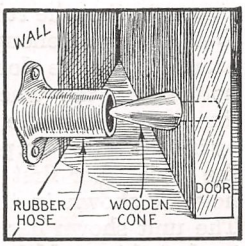
Reducing Amperage Capacity of Small Electrical Fuses

When a small electrical fuse is needed and the only one available is of too large capacity, the current it will pass may be reduced from 3 to 5 amps. by stretching the wire inside the fuse. To do so heat one of the metal end caps until it can be loosened, and then turn the cap to the right or left. This twists and stretches the wire and reduces its size, making it burn out at a lower amperage than its original rating.



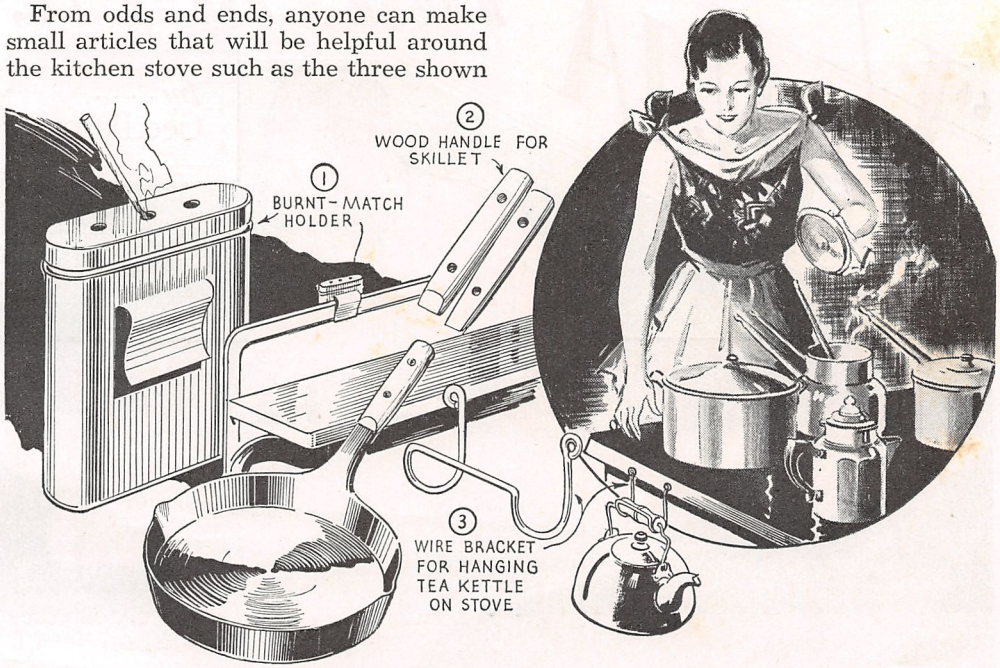
Combined Bumper and Door Stop Made from Rubber Hose

An unusual door stop is made from a short piece of rubber hose and a wood cone. One end of the hose is cut to leave small projections which are nailed to the wall as shown, while the cone has a short dowel turned on one end for attachment to the door. When the latter is pushed firmly against the hose, the cone is forced into it to hold the door. —G. E. Hendrickson, Argyle, Wis.



Three Helpful Ideas around a Kitchen Stove

From odds and ends, anyone can make small articles that will be helpful around the kitchen stove such as the three shown



in the drawing. A simple receptacle and extinguisher for matches used in lighting oil and gas stoves is shown in Fig. 1. This is merely a tobacco tin with three holes in the lid to take the matches, and a small portion of the back cut and bent to form a clip for attaching it to the back of a stove. Women who prefer to use a cast-iron skillet will find that a hardwood handle attached with small bolts countersunk in the wood as shown in Fig. 2, is much cooler to handle than a metal handle. The problem of finding a convenient place for the teakettle when the stove top is crowded, is solved by a wire bracket bolted to the edge of the stove as in Fig. 3.

Effective Photo-Print Straightener for Home Photographers

Anybody can make this photo-print straightener, which is merely a strip of soft leather kept under tension by a screen-door spring fastened to a wall, and straightens the prints by pulling them under a rod as shown in the photo. The rod is drilled at the ends and is screwed to a couple of vertical pieces fastened to a base, which is in turn screwed to the work table. Small wood blocks fastened to the ends of the leather strip provide a hand grip for operating the straightener and a means of attaching it to the spring. To use the straightener, pull the leather strip taut under the rod, place the photo face down on its surface and then let the spring pull it under the rod, keeping a fairly tight tension on the strip.

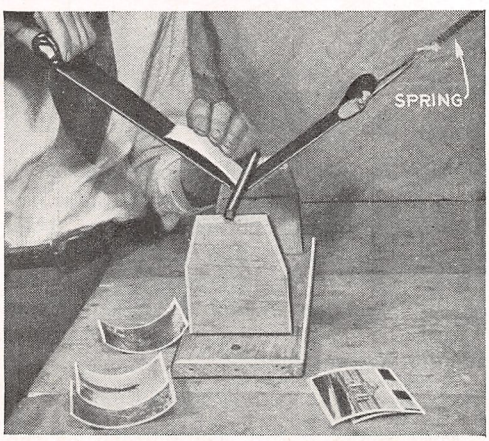
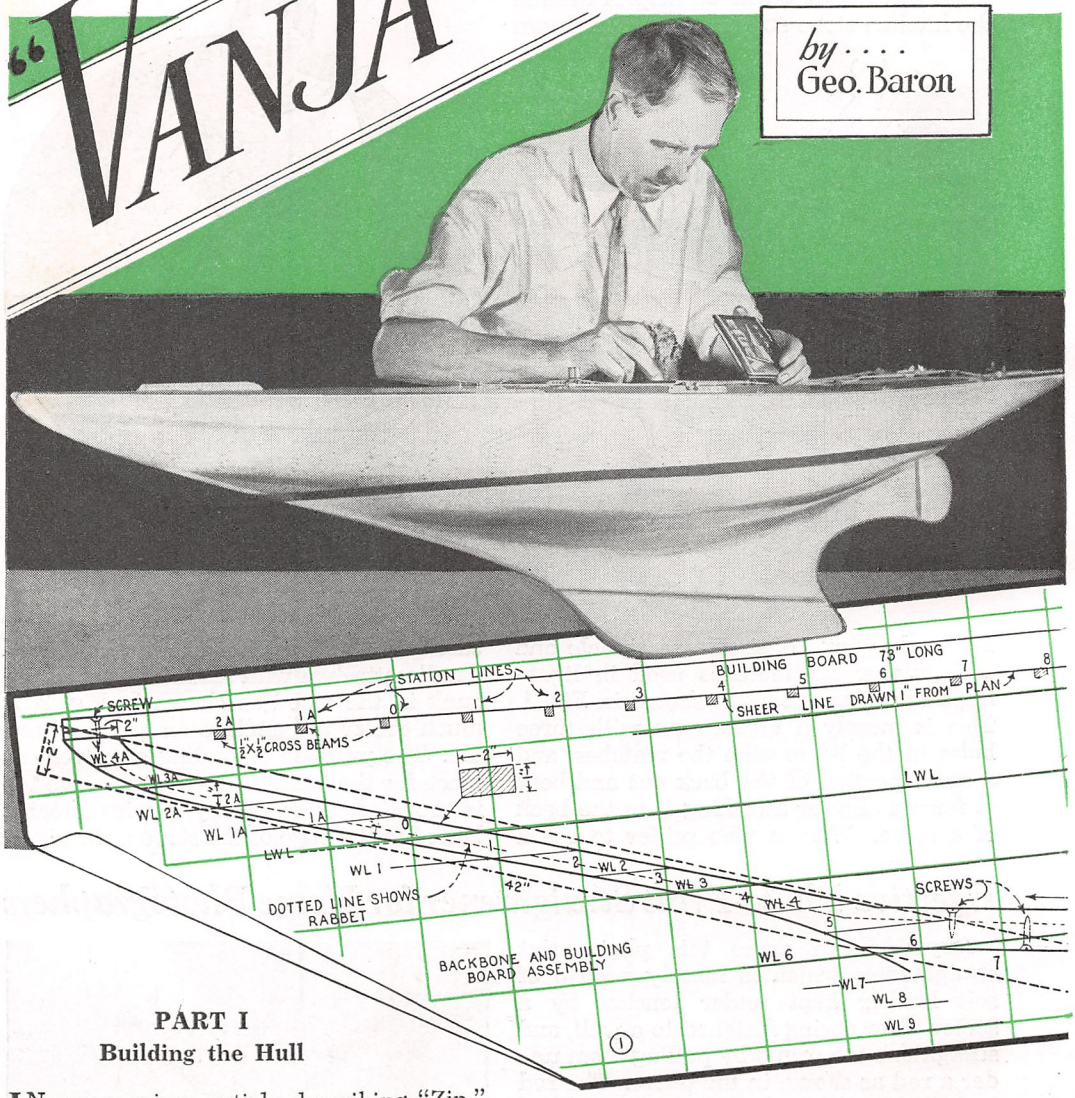


Photo Prints Straightened by Pulling Them under Rod with Strip of Soft Leather

"Vanja" Fast, Class-A,

by . . . .
Geo. Baron



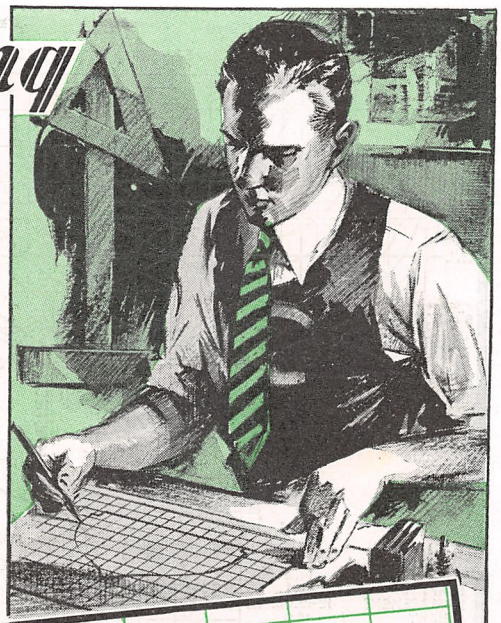
PART I
Building the Hull

IN my previous article describing "Zip," a model racing yacht of the Marblehead class, published in the June, 1934, issue of Popular Mechanics, I followed the "bread-and-butter" method of constructing the hull. But in such a large model as "Vanja," a 72-in. class-A yacht, I prefer the planked method.

Backbone and Building Board

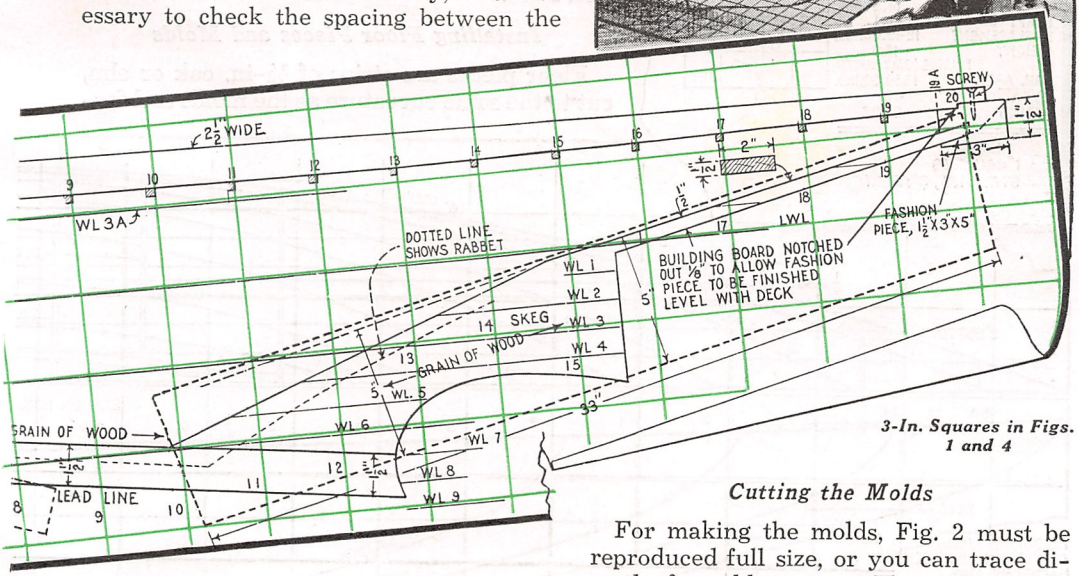
First make a full-size pattern of the backbone and building board assembly as in Fig. 1. Lay off 3-in. squares on a 15 by 75-in. sheet of tough paper and then carefully draw in the lines. The backbone is to be made up from three pieces of 2-in. white pine, as indicated by the dotted lines of Fig. 1. Using carbon paper, the outline of the backbone is transferred to the pieces of wood, which are then cut to shape and joined with ambroid glue and brass wood screws. Mark all station lines and center line on the backbone and check these with

Model Racing Yacht



In July, 1933, "Vanja," designed by George Baron, of Chicago, was awarded first place in the United States National Championship Race at Port Washington, Long Island. It then became the U. S. challenger in the International Championship Races at Fleetwood, England, held in August of the same year

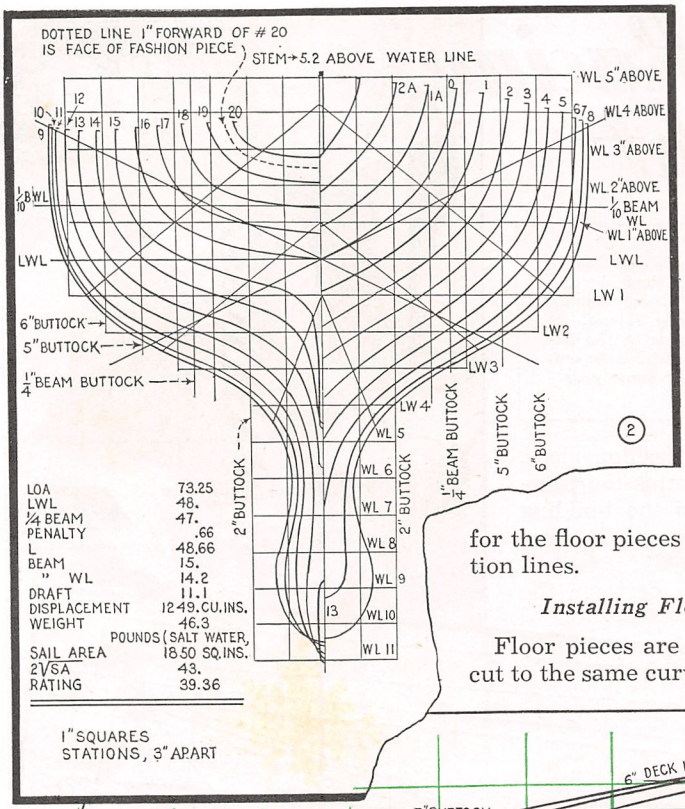
the pattern. Then add the fashion piece, Figs. 1 and 9, which later forms the transom. Join the backbone to the building board, also of 2-in. white pine. To prevent distortion of this assembly, it is necessary to check the spacing between the backbone and building board, and then install two temporary strips near stations 6 and 10, to hold the two in their correct relation, until the molds are installed. The bottom side of the building board is cut to the shape of the sheer line, Fig. 1. Station lines are marked on all sides of the building board and the center line is marked on the top and bottom. Then, to save weight, the width of the stem, forward of station 5, can be reduced to 1½ in., and similarly, the stern, aft of station 16, is cut down.



3-In. Squares in Figs. 1 and 4

Cutting the Molds

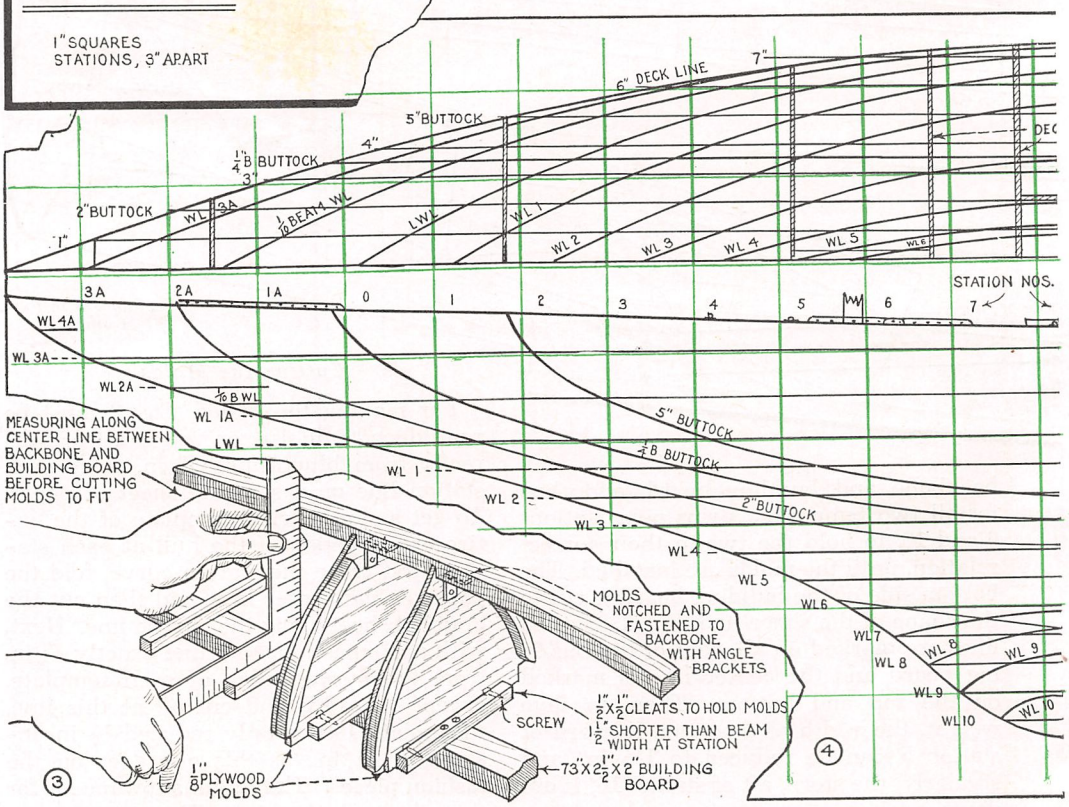
For making the molds, Fig. 2 must be reproduced full size, or you can trace directly from blueprints. Then, trace each station line on a separate sheet of paper. To get a symmetrical template of the entire cross section of the hull at each station, first trace the station curve, fold the paper at the center line, and then cut the doubled sheet along the curved line. Next, with a compass, make a line exactly ¼ in. from the curved edge of each template, except No. 19A, and cut off at this line. (Template 19A is only reduced ⅛ in. instead of ¼ in., as this one goes on the fashion piece.) The ¼-in. allowance is for the ribs and planking. The patterns are



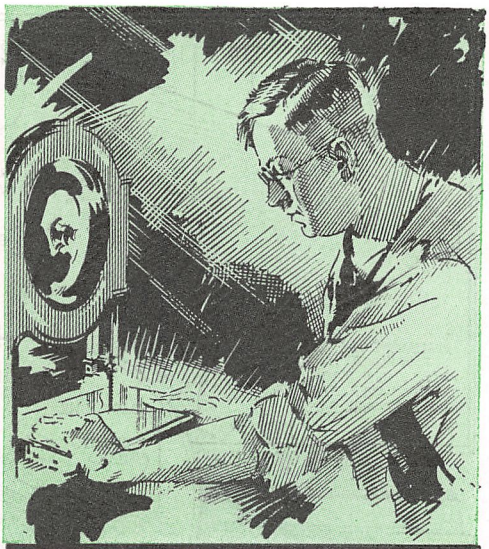
pasted on ⅛-in. plywood and cut to shape. After numbering the molds, thus formed, notch them ½ by ½ in. at the corners to allow space for the inwales. Then cut strips from ⅜-in. white pine to fit along the edges of each mold as shown in Fig. 5, these strips being glued to the molds. The strips give the necessary thickness to support the ribs and also form a ledge to clamp the ribs and planking in place. On the molds for stations 7 to 10 inclusive, allowance must be made for the floor pieces to be installed at these station lines.

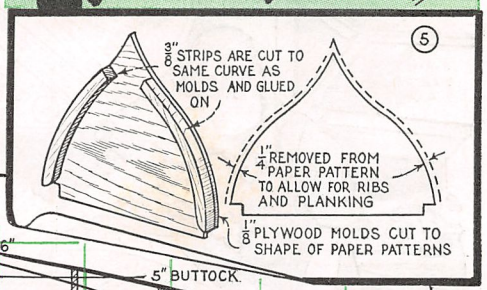
Installing Floor Pieces and Molds

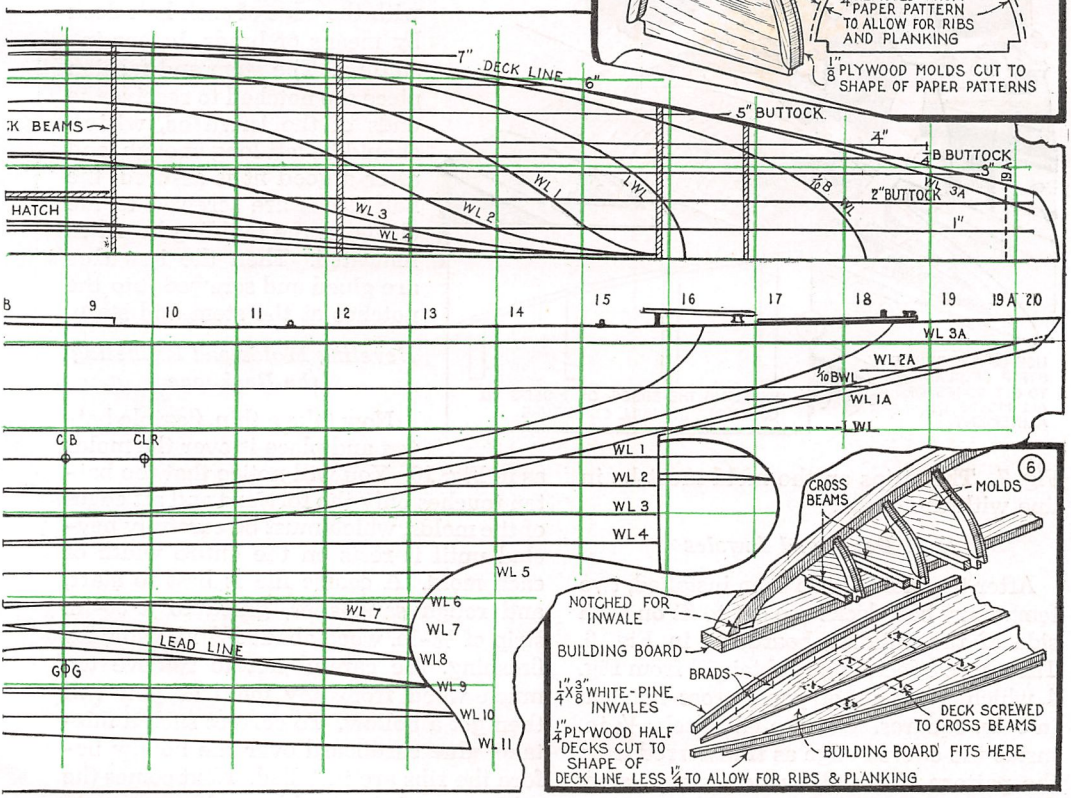
Floor pieces are strips of ½-in. oak or elm, cut to the same curvature as the molds and fas-



tened to the backbone with brass screws as in Fig. 7. The purpose of the floor pieces is to distribute the weight of the keel. When you have prepared all the molds (except Nos. 7 to 10 inclusive), they are fitted between the backbone and building board, one at each station, as in Fig. 3, which is laid off in 3-in. squares. For attaching the molds to the building board, ½ by ½-in. cleats or cross beams are screwed on. Each cleat should be 1½ in. shorter than the width of the mold it is to hold. Be sure to locate the cleats as indicated in Fig. 1; they are placed forward of stations 7 to 2A and aft of stations 9 to 19, but the cleat at station 8 is placed centrally over the line. In fitting the molds the lower end of each is notched to fit the backbone to which it is fastened with a small aluminum angle bracket. Also, the molds must be screwed to the aft side of the cleats from stations 7 to 2A inclusive, and to the forward side of the cleats from stations 8 to 19 inclusive, although this is incorrectly shown at stations 9 and 10 in







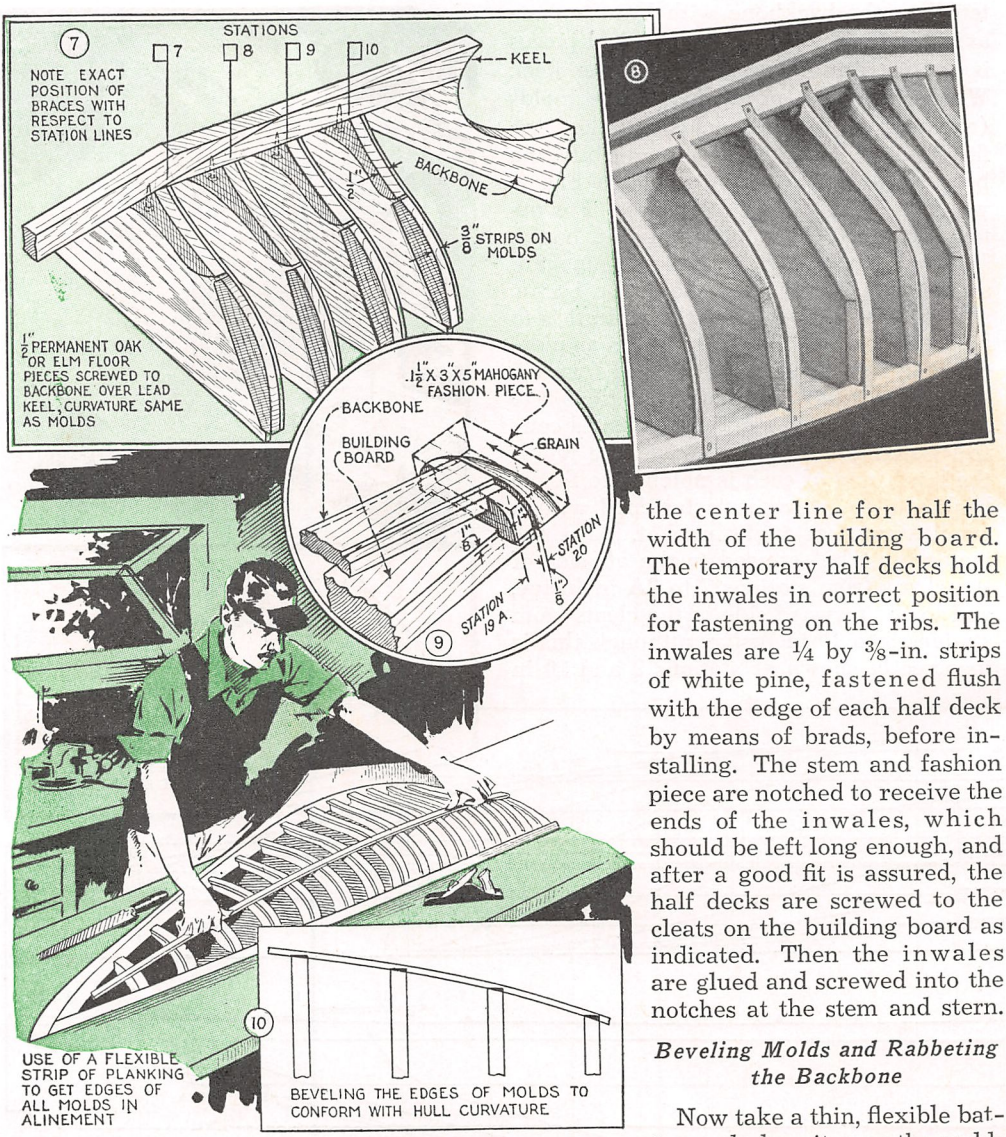


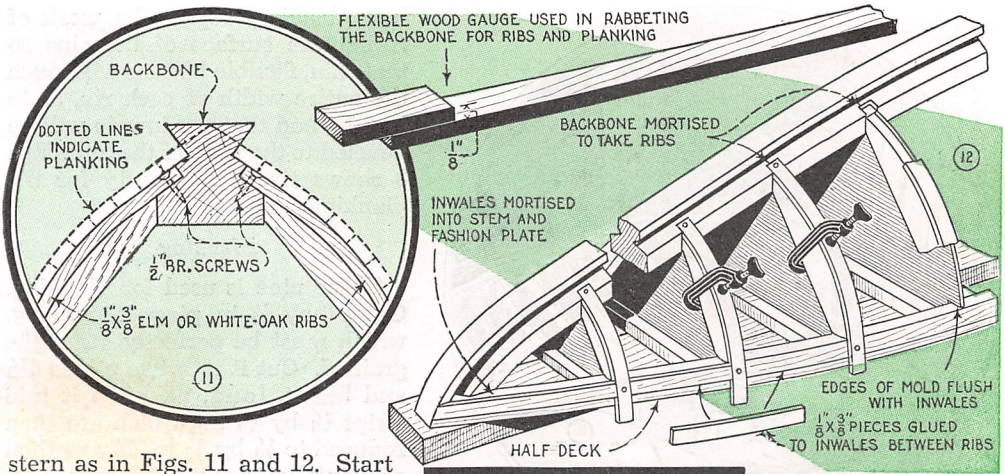
Fig. 7. The strips on the mold must be in line with the cleats.

Half Decks and Inwales

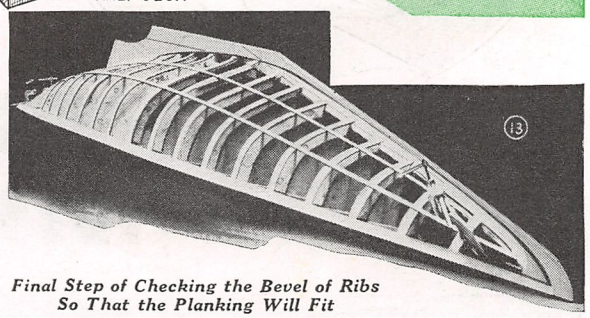
After the molds have been installed, two temporary half decks are cut to fit on each side of the building board, as in Fig. 6. The curved deck line is obtained from Fig. 4, which is laid out on paper cross-hatched in 3-in. squares. Cut the half decks ¼ in. inside the curved edge as transferred from the pattern. This allowance is necessary for ribs and planking. Also allow 1 in. at the center line for half the width of the building board. The temporary half decks hold the inwales in correct position for fastening on the ribs. The inwales are ¼ by ⅜-in. strips of white pine, fastened flush with the edge of each half deck by means of brads, before installing. The stem and fashion piece are notched to receive the ends of the inwales, which should be left long enough, and after a good fit is assured, the half decks are screwed to the cleats on the building board as indicated. Then the inwales are glued and screwed into the notches at the stem and stern.

Beveling Molds and Rabbeting the Backbone

Now take a thin, flexible batten and place it over the molds as in Fig. 10. You will notice that the batten touches only the forward and aft edges of the molds, which must be carefully beveled until it rests on the entire width of each mold. A coarse file is best to start, and rough sandpaper, glued to a 30-in. strip of ⅛-in. wood about 1½ in. wide, for finishing. Be careful not to remove too much wood from any mold as you will then get a hollow. To correct such a mistake, glue cardboard over the hollow before the ribs are installed. Next comes the rabbeting of the backbone from stem to



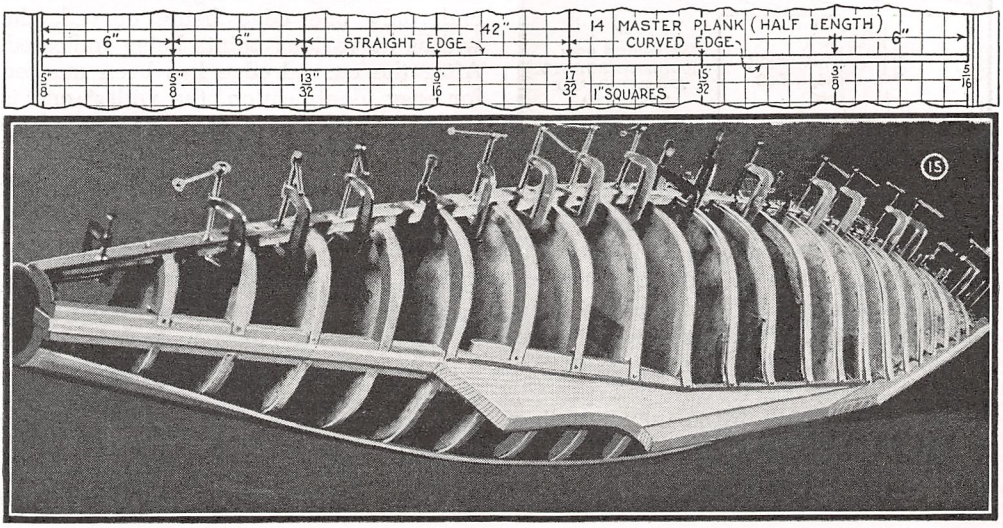
stern as in Figs. 11 and 12. Start at the after end of the skeg, marking two lines on the backbone, each on one side of the center line, ⅜ in. from it at the skeg and ¼ in. from it at the transom. Then cut a ⅛-in. rabbet along this line. Next, cut mortises, ⅜ in. wide, for the ribs. The bottom of these mortises should be continuations of the edges of the molds. At the skeg it is best to cut the rabbet from the side as shown in Figs. 11 and 20. After the ribs are installed, which is to be done next, the rabbet for the planking is beveled so that a flexible batten placed over the ribs will fit flush in the rabbet. This will assure getting the planking to fit snugly. The fashion plate is also cut to shape and rabbeted.



Final Step of Checking the Bevel of Ribs So That the Planking Will Fit

The Ribs

The ribs are next. They are ⅛ by ⅜-in. strips of elm or white oak. A small hole is drilled and countersunk about 3/16 in. from each end, to take a No. 3, ½-in. brass screw. The ribs are steamed to make them pliable, just before screwing them in place.

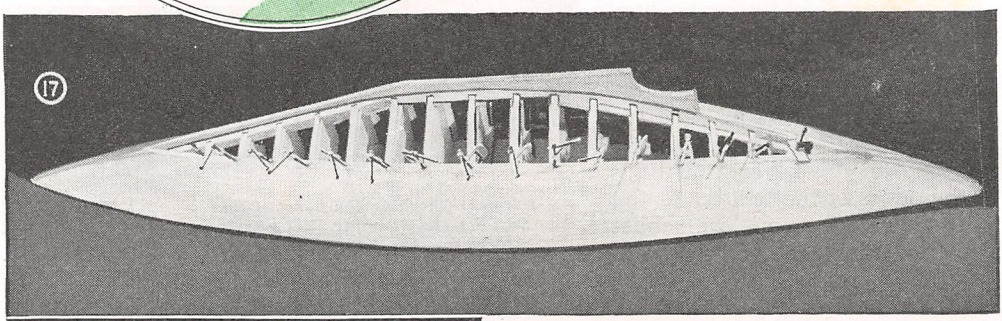


(16)

fore planking, repeat the work of truing the surface of the ribs so that thin, flexible battens will touch the entire width of each rib, as in Fig. 13, and that the inwale will be beveled to the flare of the hull. Fig. 8 shows the hull ready for the planking.

Planking

Sugar pine is used for planking. Get a 6 by ¾-in. piece, 12 ft. long, which must be perfectly straight grained. Cut it into two pieces 6½ and 5½ ft. long, and rip it into strips ⅛ by ¾ in., which are then reduced to ⅛ by ⅝ in. My method of planking is quite different from the customary procedure, but has



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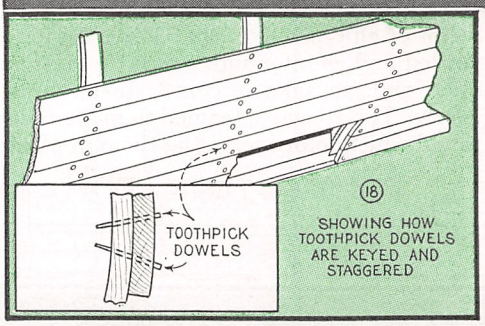
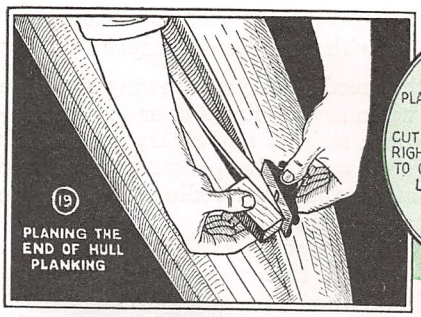
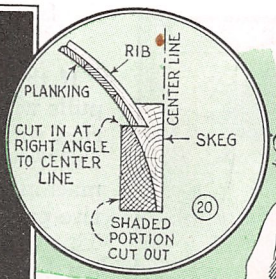


(18) SHOWING HOW TOOTHPICK DOWELS ARE KEYED AND STAGGERED

For steaming, a piece of pipe can be arranged on the end of a kettle spout, or a wire rack can be made to fit inside of a wash boiler. After a rib has been steamed, it is quickly screwed to the backbone and then bent over the mold, fastened with one or two clamps, and then screwed to the inwale. When all the ribs have been placed, cut short strips of ⅛ by ⅜-in. white pine and glue these to the inwales, between the ribs, to come flush with the surface of the ribs. See Fig. 12. As a final operation be-

proved successful and economical. In following this method, the planks are cut to ⅛ by ⅝ in., and are then shaped to the contour of a master plank shown in Fig. 14. It is 42 in. long and is tapered toward one end, only one edge being curved, the widths at various points being indicated. After the curved edge has been marked for easy identification, the widest end is laid on the center of a full length plank to be cut, and, with the straight, top edges of both planks carefully alined, the curved lower edge is traced, after which the master plank is turned over to make the curve on the other half. This is the way to cut all the planks except the first one, which is next to the deck. This one must be ⅛ in. wider than the master plank to permit it to project above the inwale. At the ends, owing to the flared shape of the boat, the inside edge of the plank will have to be high so that the outside edge will be flush with the deck. Start by fitting the bow end of the plank into the rabbet, with the





straight edge of the plank toward the deck, and clamp in position temporarily, as in Fig. 15.

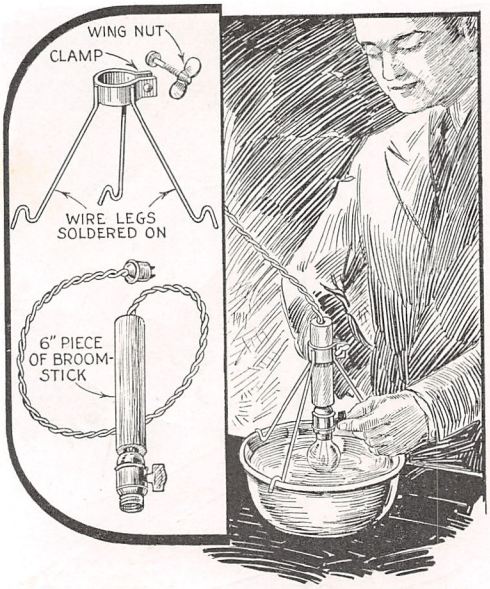
The planks are fastened to the ribs with small dowels cut from round toothpicks. Take four or five at a time and snip off about ¼ of their length with a pair of cutting pliers and then break them in the middle. With the deck plank clamped in position, drill small holes as in Fig. 16 for the dowels, into the inwale, two holes between each rib, two in the stem and three in the fashion piece. The dowels are not placed at the ribs in case of the sheer plank, as the screws holding the ribs are in the way. The size of hole should be such that only one half of the dowel goes into the hole. After the holes have been drilled, remove the plank and apply a good coat of waterproof casein glue to both the inwale and inner surface of the plank. Then fasten it in place with the dowels, first dipping them in glue and tapping them down with a small hammer, being careful to avoid splitting the plank.

When fitting the straight edge of the second plank against the first, you will notice that the straight side will have to be beveled at the bow and stern. The same applies to the next few planks, the amount of bevel changing with each one. Careful fitting between all planks is necessary. The dowel holes are staggered and drilled at an angle, ¾ in. deep, as shown in Fig. 18. Before driving in the dowels, adjoining edges of planks are coated with glue, which should ooze out when the planks are pressed in place. Snip off the projecting ends of the dowels—they will be sanded flush later. As the planks get shorter, you will not have to cut them so narrow at the ends, which is taken care of by putting the master plank in the middle of the plank you are cutting. Fig. 17 shows the planking about half finished. When you get to the skeg, fit the aft ends first. Long tapering ends are planed down to fit as in Fig. 19, holding a small block against the flat side to prevent breaking off the point. After the planking has been finished the entire surface is dressed down smooth with sandpaper as in Fig. 21, and a coat of spar varnish is applied.

Removing the Molds

The half decks and the building board are next removed, after which three or four strips of wood are screwed across the inwales to keep the hull in shape until the deck beams are fitted. The molds are then carefully broken away from the strips that were glued to them. For this you will need a chisel. To remove the strips from the ribs, to which they are fastened with dowels, take a pair of cutting pliers and snip the wood off in pieces. You can also remove some of the surplus wood along the stem and stern, to still further reduce the weight. As a guide to weight, Vanja's hull weighed 5 lbs., 5 oz. The inside of the hull is then given three coats of good spar varnish, allowing each coat to dry before applying the next. This will effectively waterproof the inside and prevent warping.

(To be continued)

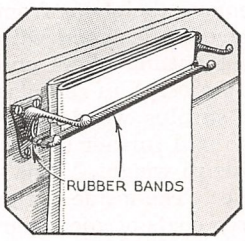


Vapor for Sick Rooms Produced by Suspending Electric Bulb in Pan Filled with Liquid

This Homemade Vaporizer Uses an Electric Bulb

When a vaporizer is needed to furnish medicated vapor for a sick room or a vapor-bath cabinet, the simple humidifier shown will be helpful. It consists of an electric bulb, socket, cord and a short piece of broomstick assembled as shown, and fastened to a small tripod. The latter is a sheet-metal clamp having three wire legs soldered to it. In use, the tripod is set over a pan containing the liquid to be vaporized and the bulb adjusted to extend into it. Rapidity of vaporization is determined by the size of the bulb.

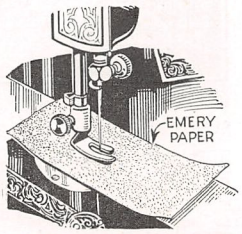
Rubber Bands Serve as Substitutes for Trouser Hangers



Stretched between two coat hooks as shown, a couple of heavy rubber bands serve nicely as an emergency trouser hanger. The trouser legs are merely placed between the two bands, after which the latter are pushed close together under the cuffs to hold the trousers in place.

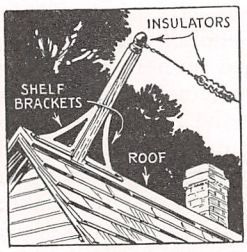
Sewing-Machine Needle Cleaned with Fine Emery Paper

If the needle on your sewing machine pulls when sewing fine silk or similar fabrics, run a strip of fine emery paper back and forth under the presser foot of the machine so that the needle will penetrate the paper rapidly. This will sharpen and polish the needle so that it will operate efficiently. Rusty needles can also be polished in the same way.



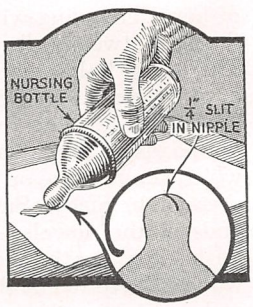
Aerial Posts Supported on Roof with Shelf Brackets

When it is necessary to mount an aerial on the ridge of a roof, heavy shelf brackets will be found handy for bracing the aerial support posts. The brackets are screwed to the ridge board posts, thus making a much neater job than is possible with the usual method of toenailing the posts to the roof and then bracing them with small wood strips.

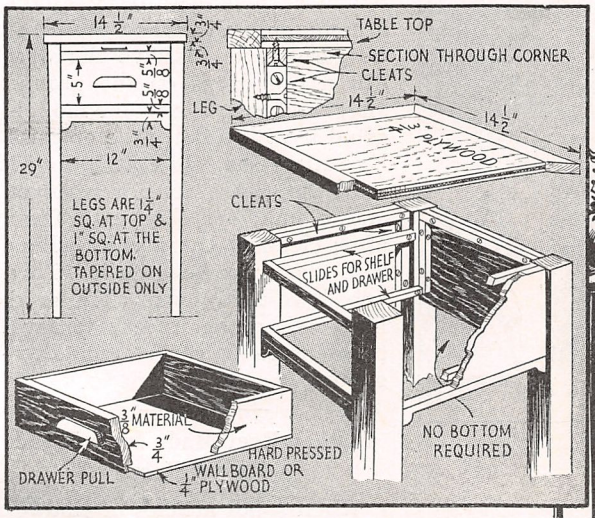


Nursing Bottle Used as Glue Spreader

An ordinary nursing bottle with nipple attached provides an effective container and spreader for glue. A ¼-in. slit in the end of the nipple allows the glue to come out when the bottle is inverted. When the bottle is set away, the film of glue around the slit dries and prevents air from entering. Squeezing the end of the nipple with the fingers before using the bottle again will break the film so that the glue will flow.—A. H. Waychoff, Tempe, Ariz.



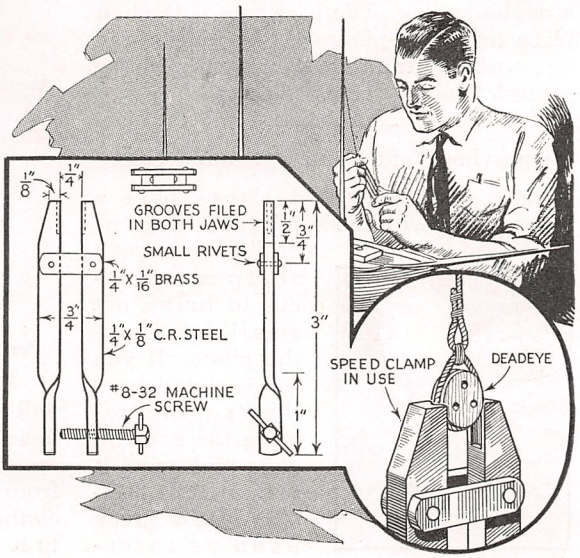
Night Table Is Assembled without Mortising

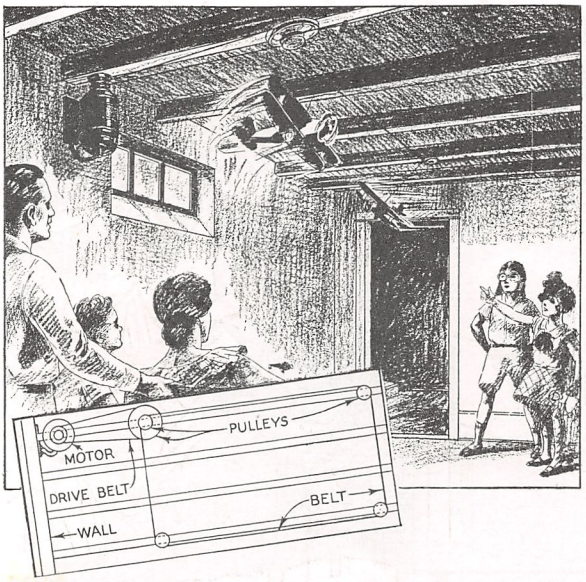


Made of oak, birch, mahogany or other wood that will take an oil stain, this night table is simple to make and is an ideal project for the young woodworker. Note how the side panels and legs are assembled with cleats and wood screws. Glue is used where the joints butt together, taking care to wipe off any surplus that is squeezed out when the screws are tightened. Besides a drawer, the table is provided with a sliding shelf, which may be pulled out for writing or holding food trays. Before assembling the table, a coat of filler should be applied, allowed to dry and then sanded lightly, after which a coat of oil stain is applied. After assembling the table, two or three coats of shellac carefully sanded between each coat will provide a fine finish.

Small Speed Clamp Helps in Rigging Your Ship Models

Much time and tedious work may be saved in rigging ship models by using this clamp to hold blocks and deadeyes while they are being seized to the shrouds and lines. Besides holding the blocks and deadeyes, the clamp keeps the line taut and enables the worker to check for correct alinement of the deadeye in its place on the model. The inside surfaces of the jaws are grooved to prevent damaging the lines around the deadeyes when they are gripped. The steel handles are given a quarter turn near the ends, permitting a machine screw to be driven into a hole, which is drilled and tapped into one handle to hold the clamp on the work.





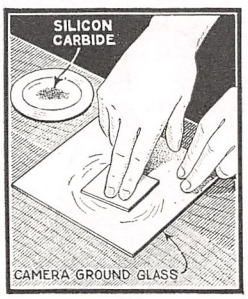
Small Model Airplanes Give Realistic Imitation of Flying When Suspended from Traveling Belt Driven by Motor

Belt-and-Pulley Arrangement to Fly Model Planes

Small, non-flying models of airplanes can be given a realistic appearance of flying by suspending them with fine wire from a traveling belt, which is motor-driven and runs over an arrangement of V-pulleys similar to the one shown in the detail. The arrangement of pulleys may be varied to suit, the only requirement being that the one driven by the motor be a double pulley. The basement is the best place to fly the planes as the pulleys can be suspended from the floor joists with lag screws, which serve as spindles.

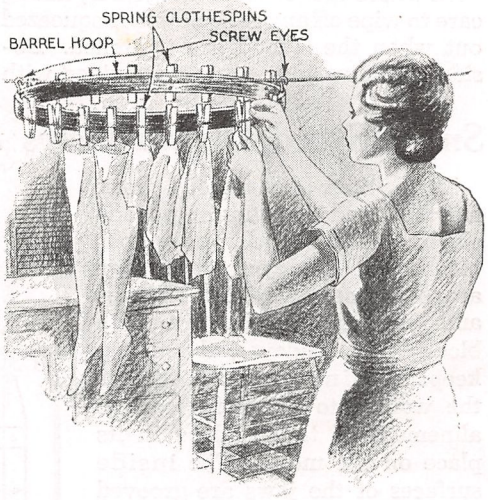
Improving Your Camera Ground Glass

Some camera ground glasses have a coarse grain with the result that it is rather difficult to get a sharp enough focus to bring out small details on the photo. If you have experienced this trouble, remove the ground glass and grind it with silicon carbide of the grade used as razor-strop dressing, which may be obtained at most hardware stores. Shave a small quantity of the dressing into a dish and add a little gasoline to dissolve the wax. Put a few drops on the ground glass, and with a circular motion, grind it with a flat piece of glass. Examine the work at intervals until the coarse grain is removed and a fine one obtained. Then, after cleaning the ground glass, rule two cross lines on it with a fine, hard lead pencil. The cross lines will make it easy to level the camera.—Erwin W. Fick, Davenport, Ia.



Clothes Reel Made from Wood Barrel Hoop

When small articles of clothing are washed on stormy days and it is necessary to dry them inside the house, this clothes reel, made from a wood barrel hoop, can be suspended from a short line stretched across one corner of a room or between two chairs where it will take little space. Two screw eyes that have been opened slightly, are attached to opposite sides of the hoop to suspend it from the line, after which spring-type clothespins to hold the clothes are screwed to it as shown.



Reel Made from Barrel Hoop for Drying Clothes inside House Takes Very Little Space

REFINISHING *Varnished Floors*

Renovation of varnished floors, at the first sign of wear, pays

Scratches, caused by moving heavy furniture, sanded out with sandpaper and gasoline

By BERTON ELLIOT

OLD floors—no matter what condition they are in—can be restored to their original beauty at a reasonable cost, by following the same methods that are used by professional floor finishers.

If your floors are in reasonably good condition, where the old finish has not become worn through to the bare wood, they will require very little preparatory work. However, this is important; painters generally spend more time in preparatory work on high-class refinishing operations than they do in actually applying the finish. The first step is to make sure that the floor is absolutely clean, as any dirt on the surface will be covered with varnish. Scrub the floor thoroughly with soap and water, to which a little ammonia or other reliable cleaning agent has been added. Scrub out all the cracks thoroughly. Be sure to rinse the floors thoroughly with clear water, as any traces of soap or cleaning preparation remaining on the surface are harmful to the new finish. Be sure,

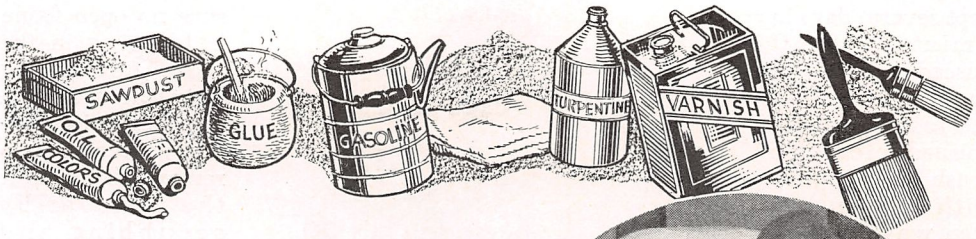
Worn places in oak floor filled with paste wood filler

also, to allow time for the moisture to dry out of cracks and crevices—overnight, with good ventilation—before proceeding to the next operation, keeping the floor clean meanwhile.

The second step is to examine the floor for marred places, dirt ground into the surface with furniture casters, stains, and other surface imperfections. These blemishes cannot be hidden by clear varnish. Stains and dirt ground into the surface can usually be removed with sandpaper dipped in gasoline or turpentine. For sanding out scratches and grooves, fold the sandpaper and use the folded edge. If the floor has been waxed, the wax must be thoroughly removed by scrubbing with turpentine, naphtha or gasoline and a handful of steel wool. Then rinse with clear water and allow to dry thoroughly. It is also desirable to wipe up kitchen floors around the stove or sink with turpentine or gasoline, to remove grease drippings and soap accumulations. The presence of wax, grease or oil on the surface will prevent the drying of new finishing coats. Cracks, holes and similar defects should be filled with crack filler colored to match the floor. Reliable crack fillers in natural and hardwood effects may be obtained at every paint store, or a simple and satisfactory filler may be made by mixing fine sawdust with cabinet-maker's glue (melted with water in a double boiler) and coloring with dry colors or oil colors to match the old finish. Use while hot, by working well into the cracks with a putty knife. When dry, sandpaper flush with the surface of the floor.

As the third step, it is necessary to sandpaper the entire floor with No. 0 sandpaper to cut the gloss of the old finish, and to give the surface a "tooth" to which the new varnish coating will adhere tightly. The next or fourth step, is to be sure the surface is dust free immediately before applying the varnish. Specks of dust make what is known as a "dirty" finish, which is very disfiguring, especially when direct sunlight shines on the floor from certain angles. Brush up all sand particles and other surface dust. Then wipe over the floor with a lintless cloth moistened with gasoline, to which fine particles of dust will cling.

You are now ready to start applying the varnish which is the final step. Only a varnish intended for floors should be used, as floor varnishes are not only extremely hard but very elastic as well; hence have



the greatest durability to withstand hard wear. It also pays to use high-grade varnish for the severe service to which floors are subjected. Cheap floor varnishes are generally brittle, and chip off easily from the scuffing of heels, scraping of chair legs, moving of heavy furniture, etc., and also turn white from water. Select a dry day for varnishing if possible, preferably warm weather or when the house is warmly heated in winter. Varnish flows out better to a smooth, even finish when warm, and dries more rapidly in dry weather. Be careful that no dust is raised in the room while you are applying the varnish, and until it has set dust-free. Remember people moving about in an adjoining room will stir up dust that will settle into your new finish. Be sure that your brush is clean. New brushes are often covered with a white powder, and generally have a few loose hairs, which should be worked out with the fingers after wetting the brush with turpentine. Start working in a corner opposite the door, and plan your work so that the place of exit will be done last. Do one strip five or six boards wide, entirely across the room. This gives you a chance to get back to start another strip before the varnish commences to set up. In this way, you avoid showing laps where the two strips join. Brush lengthwise with the grain, with long, even strokes, having the brush well filled with varnish, but brushing it out moderately well. Be careful not to skip any places. Skipped places, often called "holidays" by painters, are very disfiguring to an otherwise perfect finish. By getting down close to the floor after completing each strip, and looking across toward the light, any skipped spots will be apparent. They should be coated before the varnish sets; while you can still reach them. Remember that a uniformly even thin coat makes a harder, more wear-resisting finish than an over heavy coat. Ordinarily one coat is sufficient for a good revarnishing job over an old finish in average good condition. When finished varnishing, if you are going to use the brush the following day, it may be stood overnight in a container of water, or it may be

Above, sandpapering old finish to cut the gloss so refinishing coat will adhere well. Below, worn spot is matched with rest of floor by wiping on stain

kept several days in a mixture of half linseed oil and half turpentine. After the job is entirely finished, clean the brush thoroughly with turpentine, then wash in soap and water, dry thoroughly, and put away in a paper bag to keep it free from dust.

The best way to refinish badly worn floors is to have them sanded with an electric sanding machine. This not only takes off the old finish but resurfaces the wood, so that it is exactly like new flooring. You can then build up a new finish from the bare wood. Varnish or paint is also sometimes removed from floors by scraping with a carpenter's steel scraper or by planing; then sandpapering by hand. This is tedious and laborious work for the inexperienced and not always successful, but for those who are used to carpenter work it is a satisfactory and efficient method.

Applying the varnish; brush with the grain, doing a strip of five or six boards entirely across the room

Another method of removing old floor finishes is to use chemical paint and varnish removers. For those without previous experience, this is one of the most satisfactory methods, if directions are followed exactly. Caustic soda and lye, however, should never be used, as they discolor the wood badly. Prepared removers, which may be obtained at any paint store, are used by brushing the remover onto the surface, allowing it to stand a few minutes until the old finish becomes softened, and then scraping the old coatings off with a broad putty knife or painters' scraper. Have good ventilation in the room to carry off the fumes while working, and be sure no open flame is burning in the room. After using paint and varnish remover, it is absolutely necessary to remove all traces of the remover by scrubbing and washing up with gasoline, turpentine or denatured alcohol, being sure to scrub out all cracks and crevices thoroughly. Any traces of the remover left on the surface will prevent the drying of refinishing coats. In case there are any badly discolored, greyish places where the floor has been worn down into the wood, in doorways, etc., these should be bleached as will be explained presently. After the old finish has been taken off the floor by one of the foregoing methods, you are ready to build up the new finish.

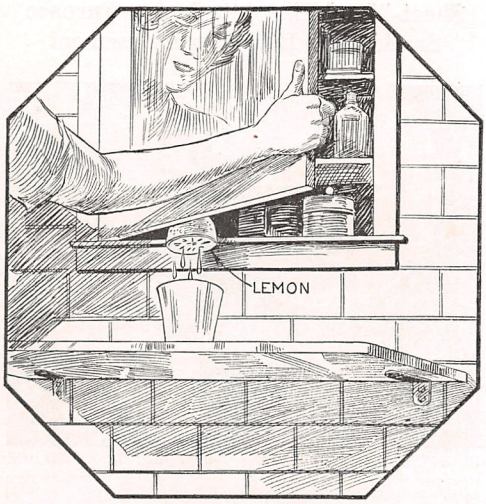
If the floors are oak, ash or other open-grain wood, it will be necessary to fill the open pores of the wood, the same as in finishing new floors. This is done with wood filler, which comes in heavy paste form, to be reduced, immediately before using, with turpentine or benzine to about the consistency of varnish. Apply the filler with a brush, let it stand a few minutes until it commences to lose its luster, then wipe off all excess filler, across the grain, with a piece of cloth, burlap or excelsior, being sure to wipe clean. Allow to dry overnight; then sandpaper well, and dust clean. If floors are to be finished natural, use "natural" filler; if to be stained, use "walnut" or "oak" filler, etc. If floors are to be stained, apply one coat of stain, being careful to brush it on evenly. If penetrating dye stain is used, the stain must be sealed in with a thin wash coat of shellac (ordinary commercial "4-lb. cut" shellac reduced with an equal part of

denatured alcohol). All that now remains is to apply the finishing varnish coats. For a thoroughly durable finish, three coats should be applied. Two-coat jobs will not withstand grinding footwear for a satisfactory length of time. For the finest finish, sandpaper lightly, with fine sandpaper, between all coats.

If you do not wish to go to the labor and expense of removing the old finish and building up a complete new finish, a satisfactory "touch up" refinishing job can be done, as follows: Clean the floor thoroughly. Examine floor for marred places, scratches, and discolorations, and sand them out with sandpaper and gasoline, also fill cracks, as previously described. Bleach all greyish, discolored places, which have been worn down into the wood, with oxalic acid, as follows: Dissolve 1 oz. of oxalic-acid crystals in a pint of boiling water. Apply this to the worn places, let stand 3 or 4 hrs. and then rinse off with clear water. If floor is oak, ash or other open-grained wood, "fill" worn places as previously described. Then bring the worn places to an approximate match with the rest of the floor by touching them up with stain to match the floor. If stain is too dark, it can be lightened a little by adding turpentine. Next, apply two coats of floor varnish over the worn places, allowing each coat to dry thoroughly, sandpapering the old finish before starting to cut the gloss and also sandpapering lightly between coats, being sure to dust away sand particles and sawdust. Finally, apply the finish coat of varnish over the entire floor.

Simple Method of Improving Salt and Coffee Containers

By cutting small openings in the lid and top edge of a can containing salt, ground coffee or sugar, a hole is provided for pouring out the contents. The hole is opened or closed by turning the lid to the right or left. If the lid is a loose fit, it should be held with one hand when pouring out the contents. —A. H. Waychoff, Tempe, Ariz.



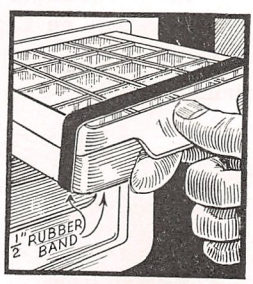
When No Fruit Juicer Is at Hand, a Cabinet Door Will Serve the Purpose

Cabinet Door Serves as Lemon Squeezer

The next time you need a lemon squeezer and none is at hand, try squeezing the lemon between the door and bottom shelf of your kitchen or bathroom cabinet. Place the lemon as near the hinged side of the door as possible to get the greatest amount of leverage and hold a glass underneath to catch the juice.

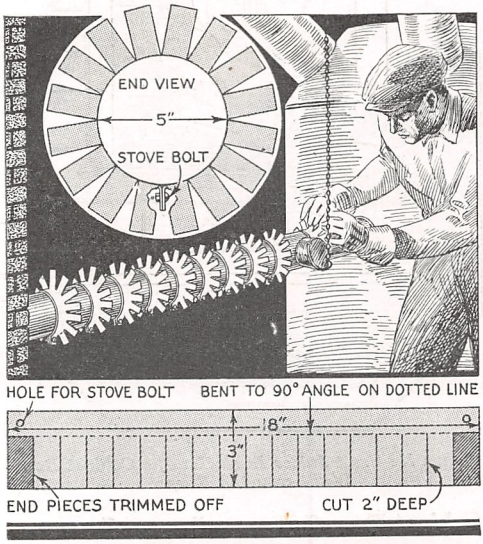
Rubber Band Helps Prevent Sticking of Ice-Cube Trays

If the ice-cube tray in your refrigerator has a tendency to stick, a ½-in. rubber band slipped over the end of the tray will help to prevent this trouble. The band raises the tray so that the bottom does not make full contact with the freezing chamber. Besides this precaution, it is a good idea to wipe water off the bottom of the tray each time it is filled.



¶Melted paraffin poured over the surface of paint left in a can after use, will prevent skin from forming and also keep the paint from drying out.

Sheet-Metal Fins Attached to Furnace Smoke Pipe Help Warm Basement



Fins Clamped to Furnace Smoke Pipe Radiate Waste Heat to Help Warm Basement

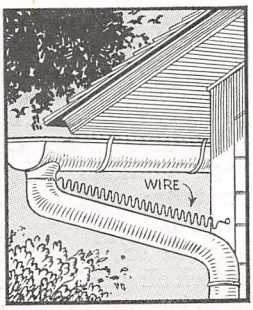
Much of the heat that ordinarily goes up the chimney from the home heating plant can be utilized to heat the basement by fastening these radiating fins around the smoke pipe. The fins are cut as indicated by the pattern in the lower detail and are clamped to the pipe with stove bolts. When attaching the fins, be sure to clamp them tightly so that the heat will be conducted readily from the pipe to the fins.

Section of Inner Tube Provides Grip on Large Bottle

To avoid breakage of a large bottle or similar container by having it accidentally slip out of your hands, cut a section from an old inner tube and slip it over the bottle. Such a holder can be made still more effective by punching small holes near the edges of the rubber and inserting skewers or lengths of small dowel rods as shown. The rubber also cushions the bottle when it is stored with others.—F. W. Bentley, Jr., Missouri Valley, Ia.

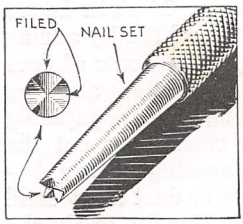
Wire Prevents Birds from Roosting on Eave Spout

To prevent birds from roosting on horizontal sections of eave spouting above windows, doors and sidewalks, crimp a length of wire as shown, and stretch it above the spouting. One end of the wire is wrapped around the spouting and the other end is fastened to the building.



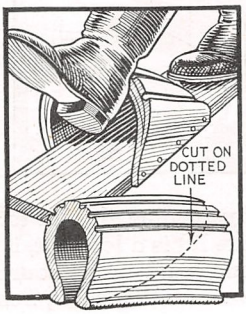
Repairing Worn End of Nail Set

When the end of a nail set, which is usually ground to a cup shape, becomes worn so that it slips off the nail heads, I grind the point square and then file two slots in it as indicated. This leaves four projecting points, which prevent the nail set from slipping off the nail heads. The repair lasts just as long as the original cup point.—R. H. Cooley, Oakland, Calif.

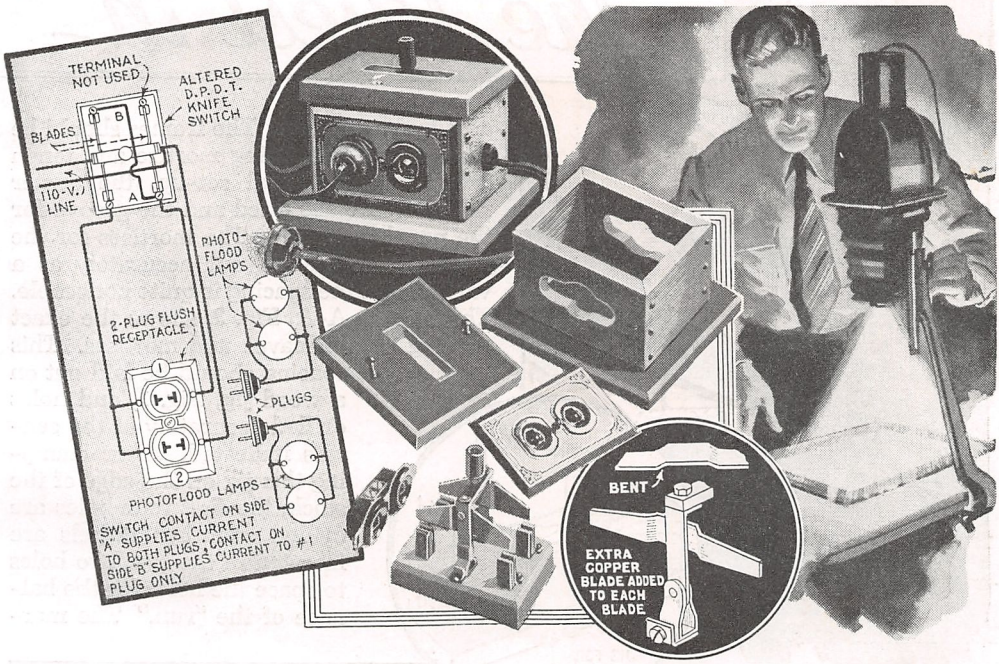


An Efficient Bootjack

A good bootjack can be had by cutting a wedge-shaped piece from an old auto tire as indicated by the dotted lines and then nailing it to the edges of a short, narrow board. A tire that is fairly stiff and of large size should be used for this purpose.—G. E. Hendrickson, Argyle, Wis.



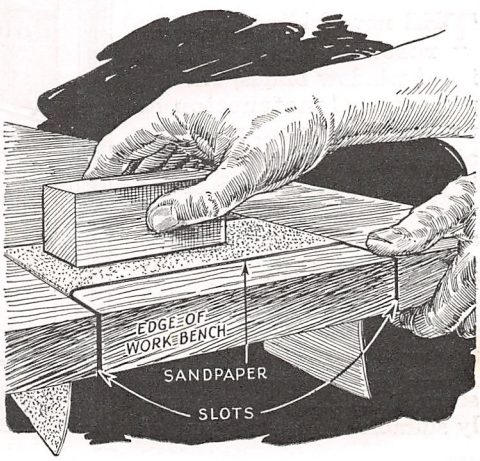
Saving Photoflood Bulbs Used in an Enlarger



To effect a saving in the life of photoflood bulbs used in an enlarger, a double-pole, double-throw knife switch, converted as shown, was installed in the circuit so that the bulbs could be burned at half brilliance for focusing, and at full brilliance when making an exposure. The switch is housed in a wood box with a double receptacle on one side. The wiring diagram shows how the line wires connect to the two movable arms of the switch, while two lines run to the enlarger, two photoflood bulbs being used on each circuit. If more bulbs are required, be sure to have the same number in each circuit. The switch may also be used with photoflood bulbs for taking night photographs. —Geo. Z. Gilbert, Hollywood, Calif.

Sandpaper in Slotted Edge of Bench Top Finishes Work

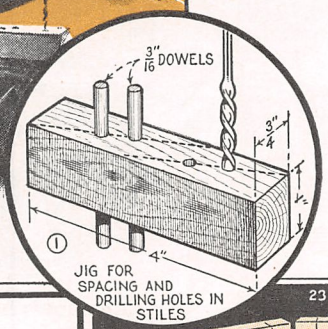
A simple method of finishing small pieces is had by sawing two slots in one edge of the workbench and then fitting a strip of sandpaper in them as shown. In this way, the work can be finished smoothly and rapidly by pushing it back and forth over the abrasive. It only takes a few seconds to change the sandpaper when necessary.

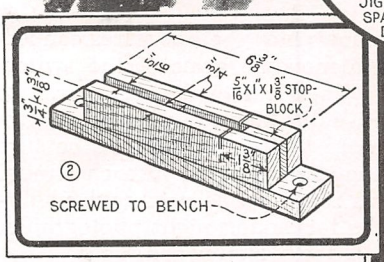


Glue for "Cellophane"

An excellent glue for sealing packages wrapped in Cellophane is made by dissolving gum arabic, 2 lbs. 3 oz., in water, 3¼ qts., and glycerine, 4 lbs. To this sticky solution is added formaldehyde, ⅛ oz. The glue is best applied with a brush.

The Latest in



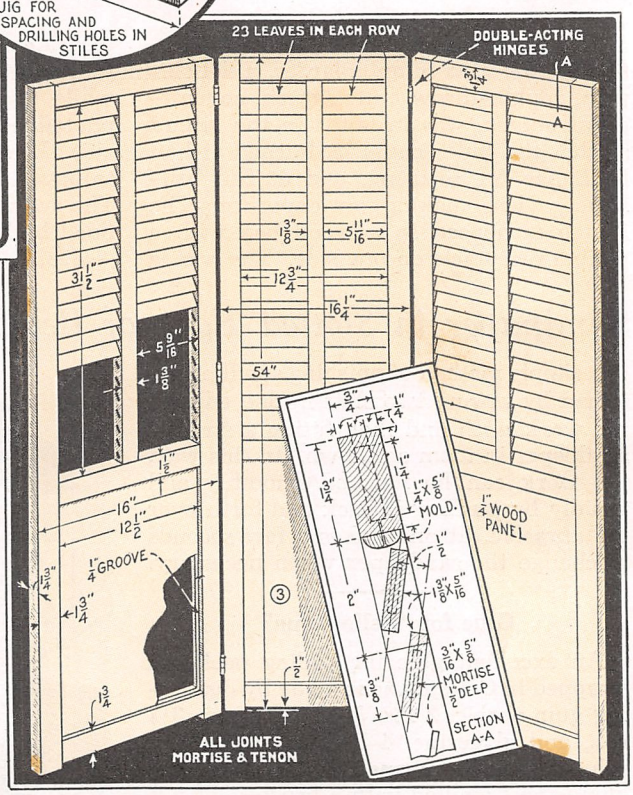


By R. O. BUCK

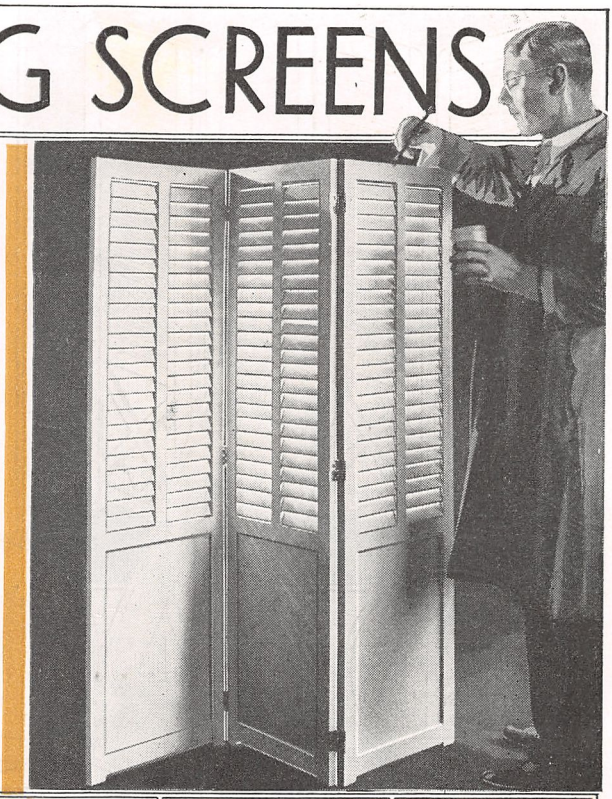
Lane Technical High School, Chicago

THE new folding screens resemble the old-fashioned window blinds, once so popular. Construction of these screens is not only very attractive, but also useful, for it permits the passage of air while shutting out sunlight and vision. White pine is used for the frames with ¼-in. fir plywood for the panels and pine lattice material for the leaves.

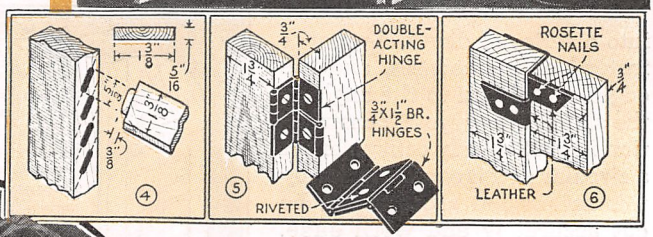
The three-panel design, shown in Fig. 3, is particularly suitable for use in front of a bedroom window. The frames should be constructed first, using mortise and tenon joints. After a trial set-up, the center rail and stile are fitted and the groove for the panel is formed. The mortises for the leaves must be laid out accurately as a variation in the spacing is quite noticeable. The section A-A, Fig. 3, shows the exact spacing of the leaves and mortises. This spacing should be laid out on a wood jig, Fig. 1, and holes drilled accurately at the centers indicated. After clamping this jig on the edge of the stock, the first four holes are drilled and then dowels are inserted in the first two holes to space the holes for the balance of the "run." The mor-

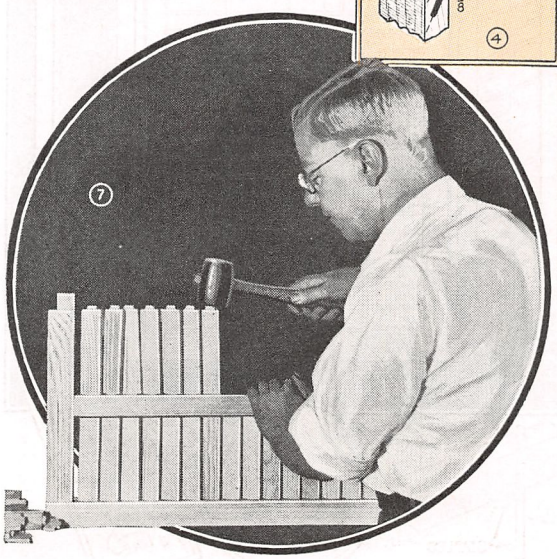


FOLDING SCREENS



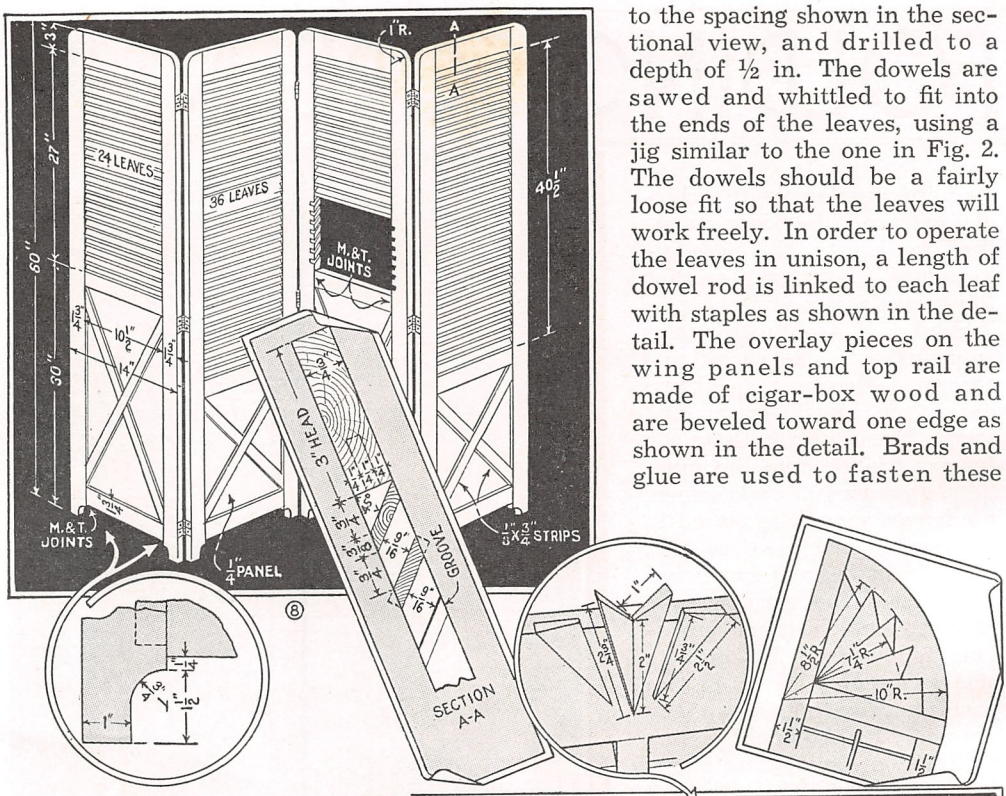
tises are completed with a chisel. After all the leaves have been cut exactly to length, allowing ⅜ in. on each end for the tenon, a second jig, Fig. 2, is used to make the shoulder cuts uniform. The cheek cuts are so shallow that a sharp chisel will serve in making them. Fig. 4 shows how the leaves are set into the mortises. In assembling the screen, the leaves should be placed in the center rail mortises first, then the stiles and outer rail are added. The work is then reversed and the same procedure followed on the opposite side as in Fig. 7. After the panels have been glued up they are ready for the final dressing with a sharp smoothing plane, followed by sanding. To have the panels swing in either direction, double-acting hinges, as in Fig. 5, are used. If you do not wish to go to this expense or trouble,



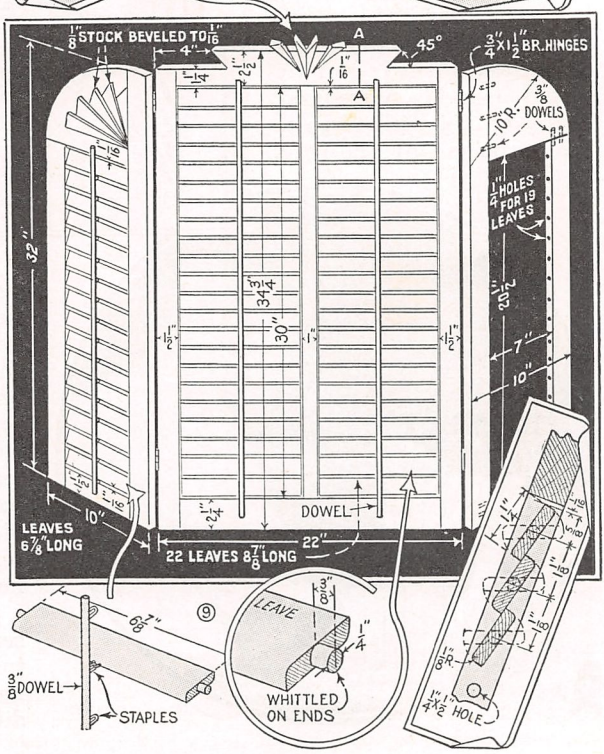


serviceable double-acting hinges can be made by riveting two hinges together. See Fig. 5. This method has the slight disadvantage that the center portion of the hinge will swing out unless care is taken to press horizontally when moving a panel. The leather-strap hinges, Fig. 6, are inexpensive substitutes. The metal hinges require shallow mortises on both panels, just deep enough to house the hinge leaves.

The framing of the four-panel screen, Fig. 8, is similar to the one just described, but the method of mounting the leaves is somewhat different. The leaves are simply glued



to the spacing shown in the sectional view, and drilled to a depth of ½ in. The dowels are sawed and whittled to fit into the ends of the leaves, using a jig similar to the one in Fig. 2. The dowels should be a fairly loose fit so that the leaves will work freely. In order to operate the leaves in unison, a length of dowel rod is linked to each leaf with staples as shown in the detail. The overlay pieces on the wing panels and top rail are made of cigar-box wood and are beveled toward one edge as shown in the detail. Brads and glue are used to fasten these into a series of diagonal grooves instead of in mortises, and the edges are planed to the angle of the slant. This type of construction is particularly convenient if a circular saw is available, for by this means the grooves can be cut accurately and with ease. Decorative diagonal strips may be placed on the panels or they may be left plain. One of the pieces runs the whole distance while the other is divided into two sections, glue and brads being used to fasten the strips in place.



The fire screen shown in Fig. 9 has movable leaves just like those used on a window blind, making it possible for one to permit as much heat as desired to pass through the screen. The center panel is framed up in the same manner as previously described, then a series of dowel holes are laid off with dividers

pieces into place on the face of the top cross member. As there is no occasion to swing the wing panels forward, ordinary hinges are suitable for this screen. Stationary leaves may be substituted for the movable leaves, if you desire.

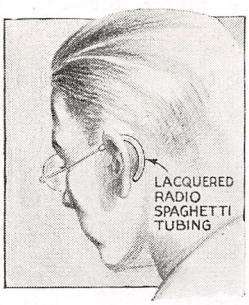
Enamel finishes are coming back into popularity and screens of this type are especially attractive when finished in white or pastel shades such as ivory, ice green or orchid. Two-tone effects are also effective. A flat finish is usually desired and therefore a gloss enamel should be rubbed flat with powdered pumice stone and water after the enamel has thoroughly dried and hardened.

Application of Chalk Helps When Filing Soft Metals

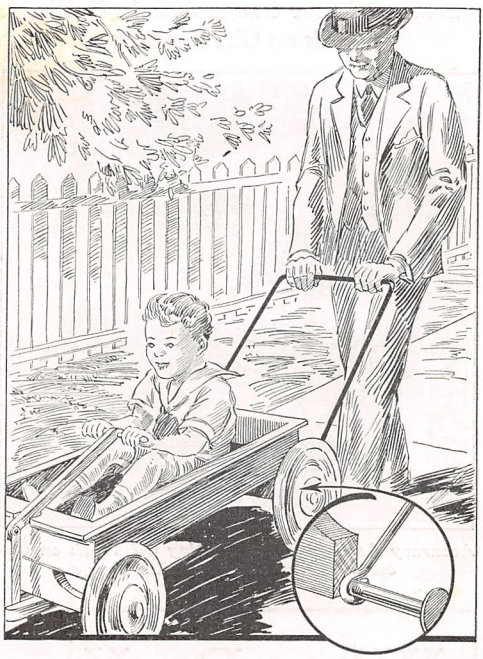
Before filing soft metals, take a piece of chalk and rub it over the file to fill the teeth. This prevents small particles of metal from wedging tightly between the teeth, thus lengthening the time between cleaning periods. It also makes the file easy to clean. The chalk does not interfere with the effectiveness of the file.

Rubber Tubing on Spectacles Protects the Ears

Instead of wrapping thread or cloth around the temples of your spectacles as is often done to prevent irritating the ears, use pieces of spaghetti tubing as shown. This is more pliable than cloth and provides better protection for the ears. A little glue will hold the tubing in place.



¶Water placed in a newly painted room will help eliminate the odor of paint.



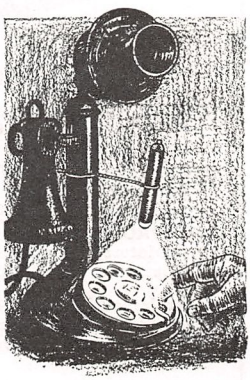
Push Bar Attached to Coaster Wagon Lets Small Boy Steer, But Gives You Control

Push Bar Gives Parent Control of Boy's Coaster Wagon

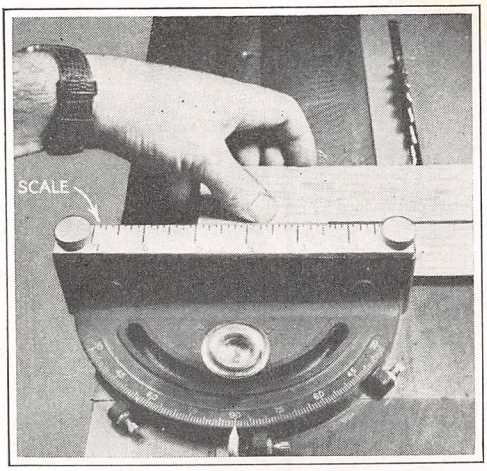
To allow a youngster the thrill of steering his coaster wagon, yet have control of it yourself, bend a length of ¼-in. iron rod to a U-shape and attach it to the rear axle. In this way, you can push the wagon and stop it when necessary.

Small Flashlight Illuminates Dial on Telephone

If you have a dial telephone and it is located in a dark corner, a pen-type flashlight, obtainable at a ten-cent store, can be attached as shown to illuminate the dial. The holder for the flashlight is made from a length of stiff wire wrapped around the telephone and the flashlight. Used intermittently, the flashlight will last for quite a while.



Scale on Miter Gauge Aids in Cutting Work on Circular Saw



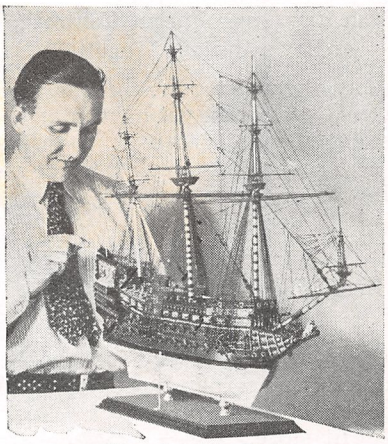
Accuracy Assured When Cutting Off Work on Circular Saw by Scale on Miter Gauge

Cutting small strips or blocks of wood to exact lengths on a circular saw is done easily with the aid of a scale or ruler attached to the top of the miter gauge. When cutting the ruler to proper length, be sure to allow for the distance from the saw to the edge of the gauge so that the reading will be accurate. Then drill a hole in each end of the ruler and place it under the nuts used for tightening the stop rods. The same idea can be used on long work by letting the ruler extend beyond the left-hand edge of the miter gauge.

Homemade Mixture Cleans Guns

A non-corrosive cleaner for guns is made by mixing together sperm oil, 1 oz., turpentine, 1 oz., acetone, 1 oz., kerosene, 2 oz., and lanolin (anhydrous) ¼ oz. This cleaner is applied with a swab in the usual manner.

What Do You Want to Make?



"Sovereign of the Seas"

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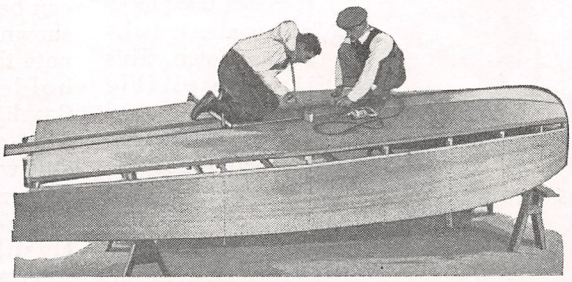


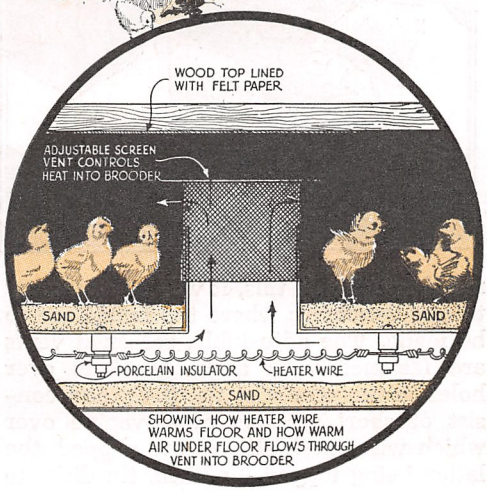
Planking "Roamer"—Popular Mechanics' Outboard Cruiser (765 to 770)

Electric UNDERHEAT BROODER

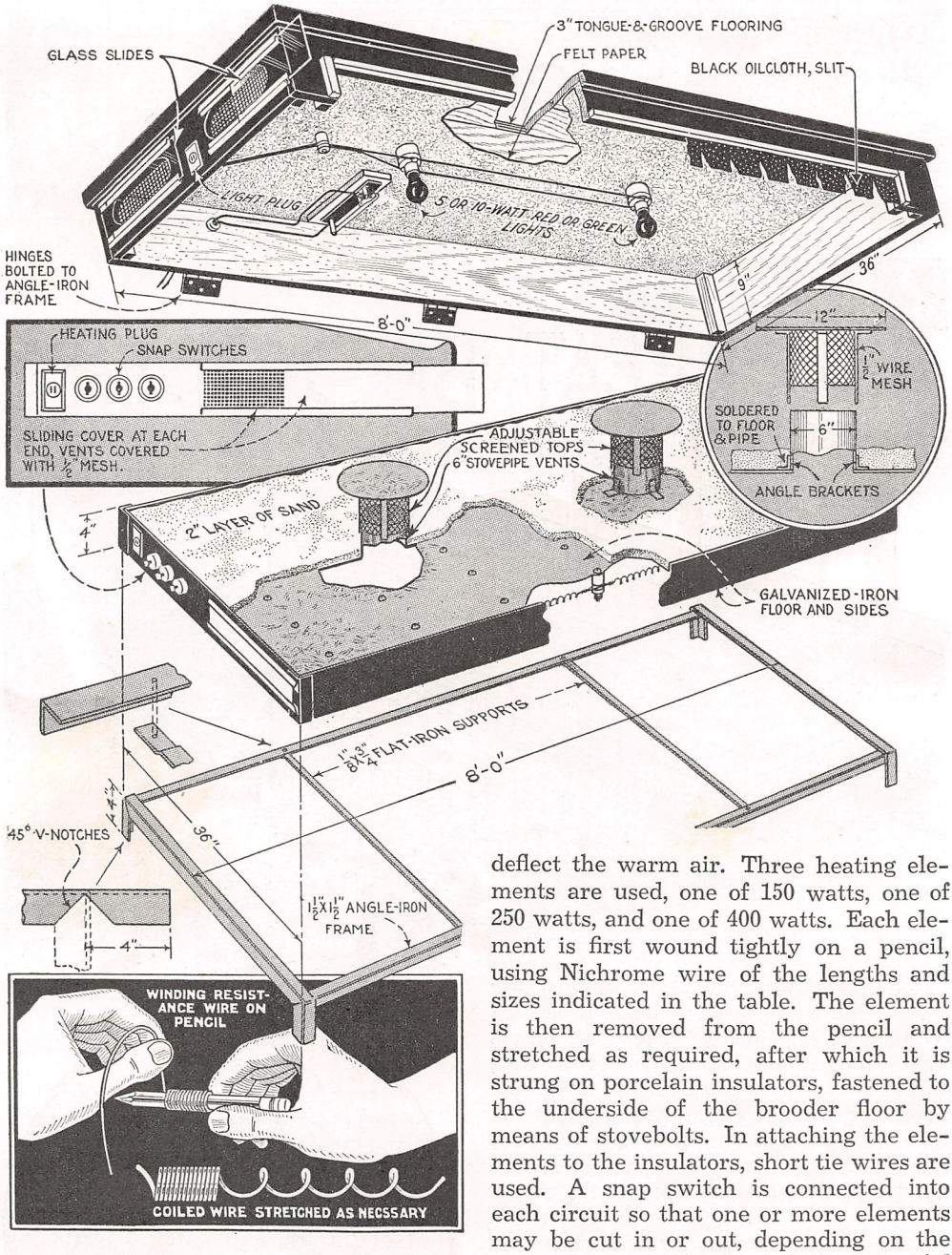
houses 500 chicks

THIS electrical underheat brooder assures a warm floor, which is necessary to keep chicks healthy. Fresh air enters vents at each end of the lower portion, where it is heated by elements under the floor, and then passes up through adjustable, screened vents into the brooder chamber. The warm air is deflected from the top of the brooder down on the chicks and passes out through the lower portion of an oilcloth curtain, which covers an entrance opening on one side.

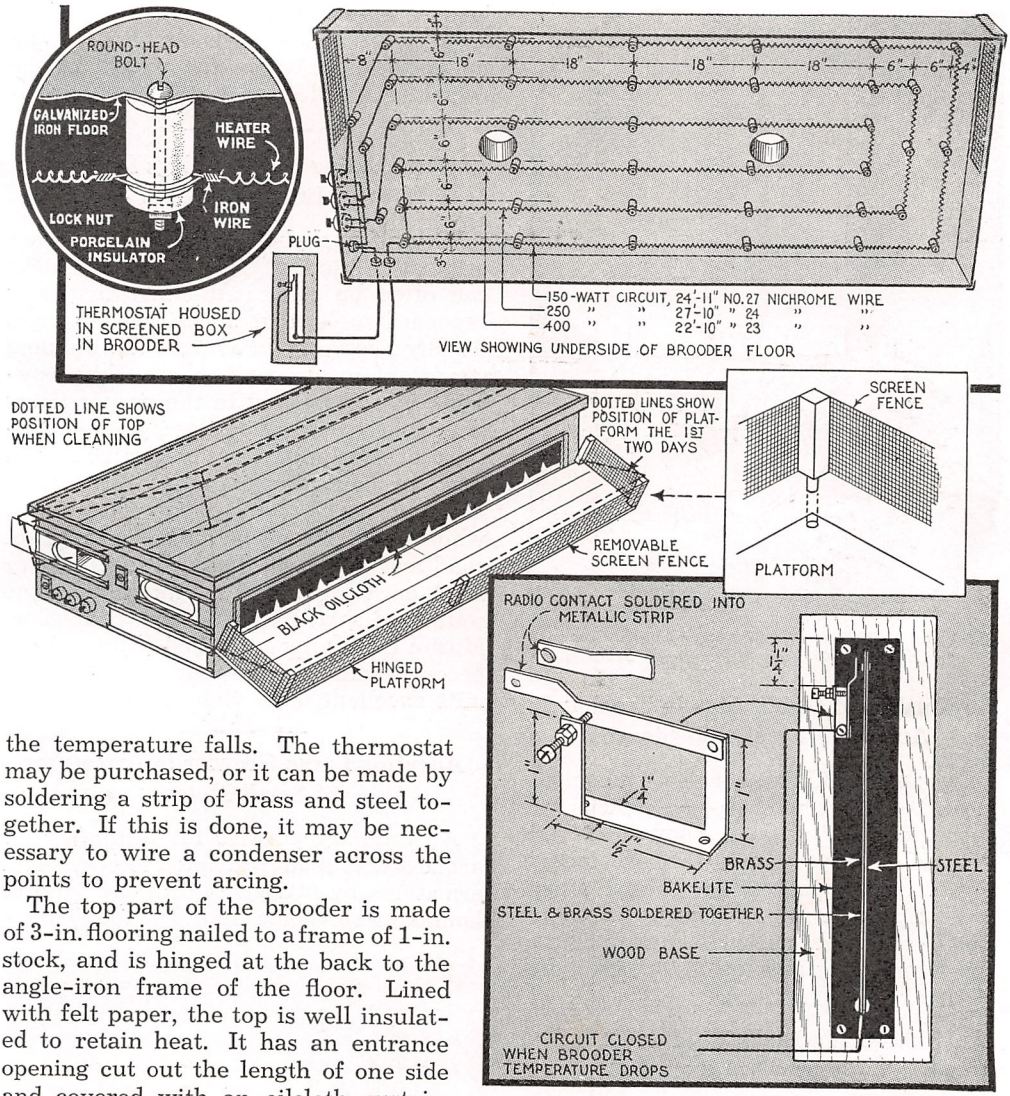
The floor of the brooder is made from No. 24-ga. galvanized sheet iron, the sides and ends being turned down to form an apron over an angle-iron frame, which is cross braced with two pieces of flat iron. The frame is supported on short legs made by bending down the ends of the cross



SHOWING HOW HEATER WIRE WARMS FLOOR AND HOW WARM AIR UNDER FLOOR FLOWS THROUGH VENT INTO BROODER



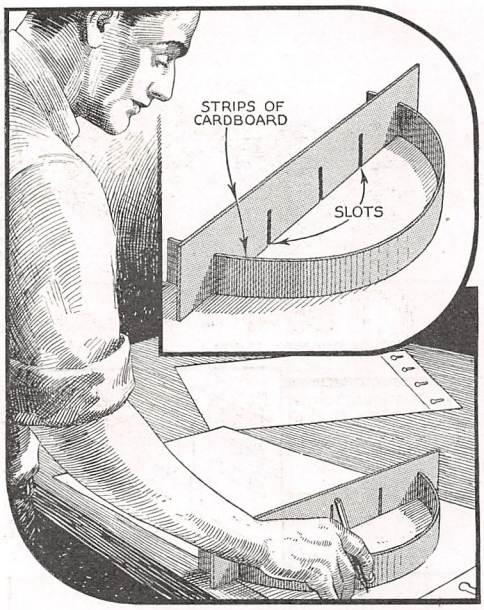
members. To do this, it will be necessary to cut V-notches where the bends are to be made. The adjustable, screened vents are fastened with angle brackets over holes in the center of the floor, and consist of short sections of stovepipe over which wire-mesh sleeves are slipped, the latter being topped by 12-in. tin disks to deflect the warm air. Three heating elements are used, one of 150 watts, one of 250 watts, and one of 400 watts. Each element is first wound tightly on a pencil, using Nichrome wire of the lengths and sizes indicated in the table. The element is then removed from the pencil and stretched as required, after which it is strung on porcelain insulators, fastened to the underside of the brooder floor by means of stovebolts. In attaching the elements to the insulators, short tie wires are used. A snap switch is connected into each circuit so that one or more elements may be cut in or out, depending on the temperature inside the brooder. Careful study of the wiring diagram will show how a thermostat is connected into the circuit to control the temperature automatically. It is mounted in a screened box inside of the brooder, opening the element circuits when the temperature rises above a predetermined point, and closing them when



the temperature falls. The thermostat may be purchased, or it can be made by soldering a strip of brass and steel together. If this is done, it may be necessary to wire a condenser across the points to prevent arcing.

The top part of the brooder is made of 3-in. flooring nailed to a frame of 1-in. stock, and is hinged at the back to the angle-iron frame of the floor. Lined with felt paper, the top is well insulated to retain heat. It has an entrance opening cut out the length of one side and covered with an oilcloth curtain, which is slit at intervals to help prevent loss of heat, yet allow the chicks to pass through readily. To permit inspection of the chicks without disturbing them, two sliding windows are provided at one end, and two colored lamps of low wattage are mounted in porcelain sockets, which are screwed to the underside of the top. These are wired to a receptacle at one end. The windows also provide additional ventilation on warm days. A feeding yard with a screen-wire fence is placed in front of the entrance opening, and is used the first few days when the chicks are small, after which the fence is removed and the yard dropped down to serve as a runway. After the brooder has been set up, the metal floor is covered with a 2-in. layer of dry sand. It is also a good idea to put sand on the floor under the brooder. The sand, besides serving as a protection against fire, absorbs heat and will help keep the chicks warm for several hours if the current should happen to be shut off.

¶When it happens that a part to be sawed or notched on a model is inaccessible to ordinary saws, a short section broken from a jewelers' saw blade can be clamped in a pin vise and used for the work.

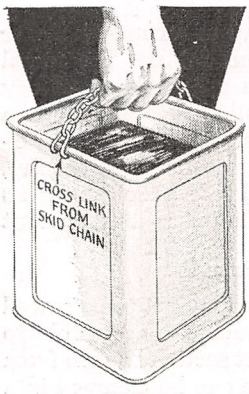


This Guide Will Be Found Better than a Compass for Scribing Arcs on Mimeograph Stencils

Cardboard Guide Aids in Tracing Arcs on Mimeograph Stencils

Due to the difficulty of using a compass to scribe arcs on mimeograph stencils, one operator uses the guide shown. A wide strip of heavy cardboard 12 in. long is slotted at 2-in. intervals to receive a narrow strip of the same material. The latter may be adjusted to provide any arc desired and then serves as a guide for the stylus.

Skid-Chain Links Used as Bails on Improvised Buckets



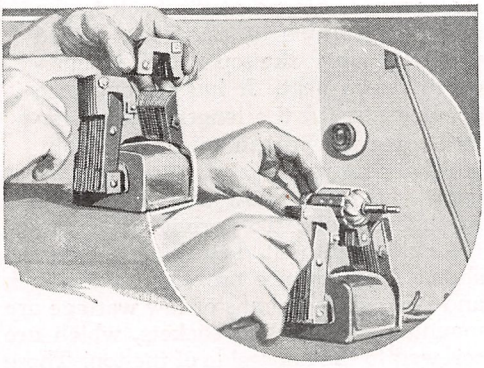
Around the shop or farm where pails and other containers are often improvised from old cans, the cross links from large skid chains will provide good bails and handles for carrying them. Small holes punched on opposite sides of the pail near the top take the opened end links of the chain, or, if there is a rolled rim around the top, the ends of the links can be beveled to slip under the rim, where the weight of the container will keep them in place.

Remodeling Old Buildings for Use as Brooder Houses

With a few slight changes, buildings not originally intended for brooding chicks can often be converted into satisfactory brooder houses at small cost. The changes usually necessary to convert the building consist of insulating it thoroughly, covering cracks, putting in the proper floors and windows of either glass, glass substitutes or muslin. Insulation can be in the form of commercial insulation board, building paper, lumber or even straw, while the floor may be alternate layers of sand and paper with a thick layer of dry sand on top. The windows should face south and should open to admit sunshine. Muslin cloth, dipped in boiled linseed oil, becomes quite transparent and thus permits excellent ultra-violet radiation.

Adapting Large Growler to Armatures of Small Motors

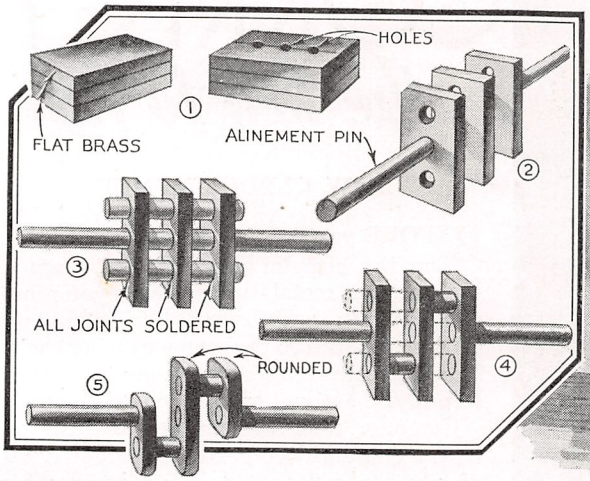
An ordinary growler for testing motor armatures is readily adapted to very small armatures by fitting it with these jaws of laminated stovepipe iron. The laminations



Extra Jaws of Laminated Stovepipe Iron Adapt Large Growler to Handle Small Work

are about 1½ in. square and are notched on one side to slip over the growler jaws as shown, the upper inside corner of each extra jaw being beveled to form a cradle for the small armature.

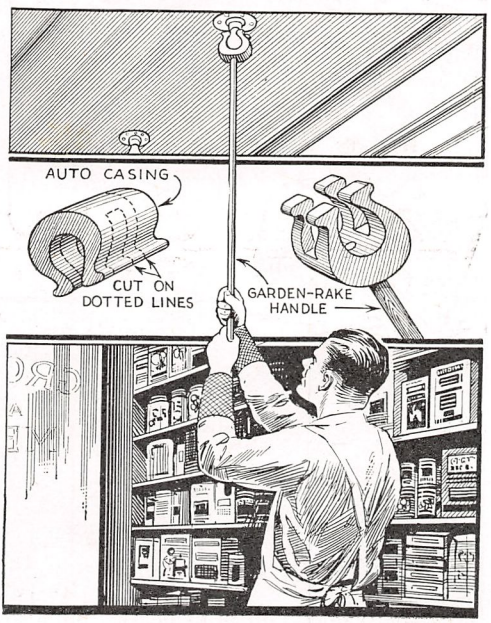
Improvement in Making Model Crankshafts



The usually difficult job of making small crankshafts for models is greatly simplified with the method illustrated in the drawing. Clamp together three pieces of flat brass and drill three holes exactly in the center as shown in Fig. 1, spacing the outside holes an equal distance from the center one. Next, insert an alinement pin, Fig. 2, and two shorter pins as in Fig. 3. Then carefully space the brass pieces to allow for the width of the connecting rods and sweat-solder the pins in place. To complete the crankshaft, saw off the pins as indicated by dotted lines in Fig. 4 and with a file round the brass pieces as in Fig. 5.—S. O. Stanfield, Orange, Calif.

Efficient Tool for Changing Electric Bulbs in High Ceilings

A piece of small-size auto casing and a broomstick or garden-rake handle are all you need to make a handy tool for removing electric bulbs that are out of reach. Cut out the walls of the casing as indicated by the dotted lines to leave four prongs and then screw it to the end of the handle. When pushed over the bulb, the rubber prongs will grip it firmly so that it can be screwed out of the socket.



Compound for Cleaning Bottles

Bottles and other glassware may be cleaned thoroughly with a solution made by dissolving the following dry chemical mixture in hot water as needed: Sodium metasilicate, 1 part, soda ash or sodium carbonate, 2 parts, and trisodium phosphate, 2½ parts. The solution made by dissolving this cleaning powder in water is very effective and may be used for a large variety of cleaning operations.

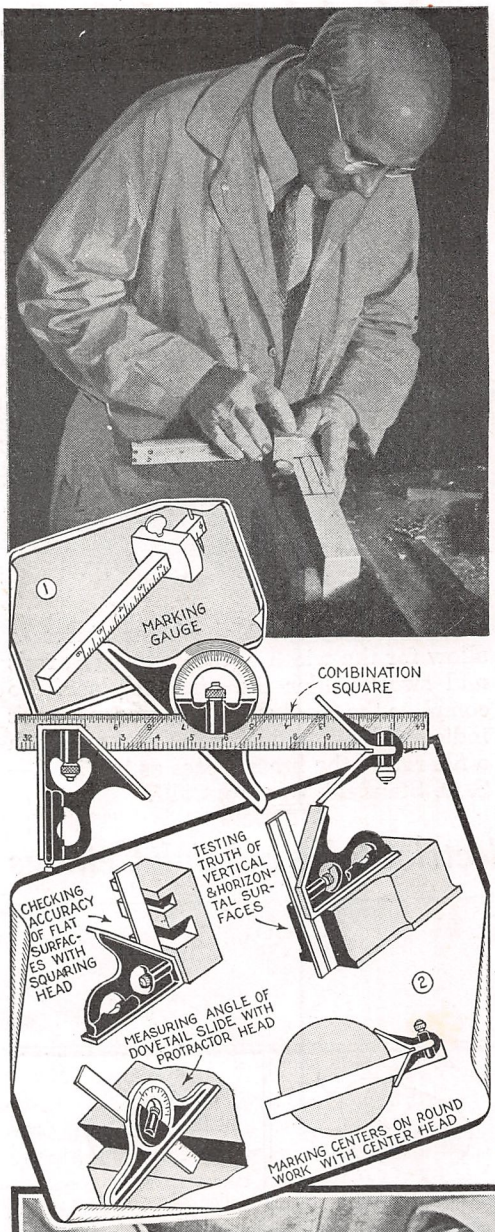
CORRECT *the key to fine*

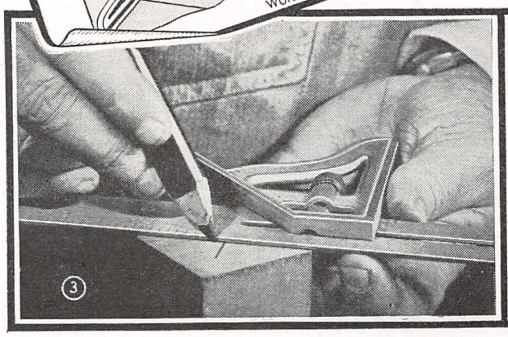
By W. CLYDE LAMMEY

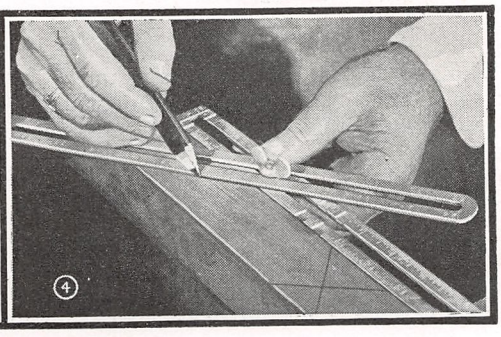
BEFORE you cut a piece of stock to size on the circular saw or turn down a shaft in your metal-turning lathe you must gauge width and length, diameter and thickness with the proper measuring tools. Making accurate measurements is the first step in the production of high-grade work.

Common measuring tools for use on both metal and wood are the various types of squares, rules, and other devices for measuring length and depth; the spring and firm-joint caliper and the micrometer for extremely accurate measurement of diameters, and also the many types of measuring devices used in layout work, such as the trammel and surface gauge and the combination square in its several variations. In addition to these there are many other measuring tools made for special work in connection with the lathe. Some tools of the same general design are made up in different types, each adapted to a special purpose, particularly the caliper and the micrometer.

One of the most commonly used tools in both measuring and layout work on either metal or wood is the combination square fitted with a squaring head, a protractor head and a centering head. Fig. 2 shows typical uses of this versatile tool. The blade is graduated in fractions of an inch, an accurate spirit level is built into the



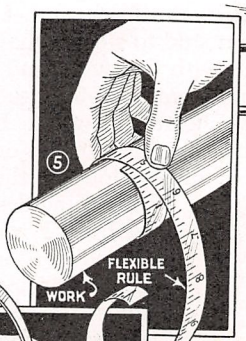


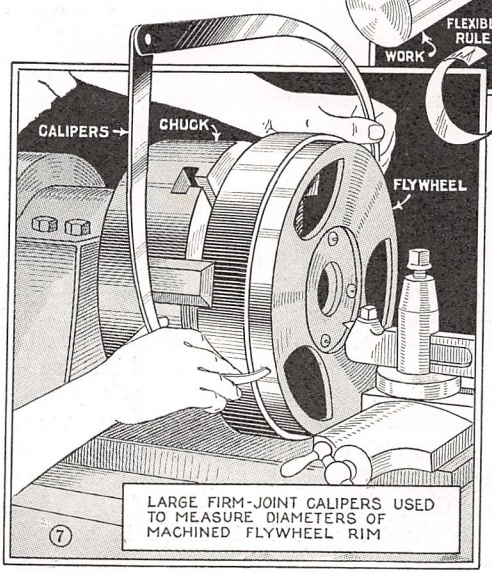


MEASUREMENTS
workmanship . .

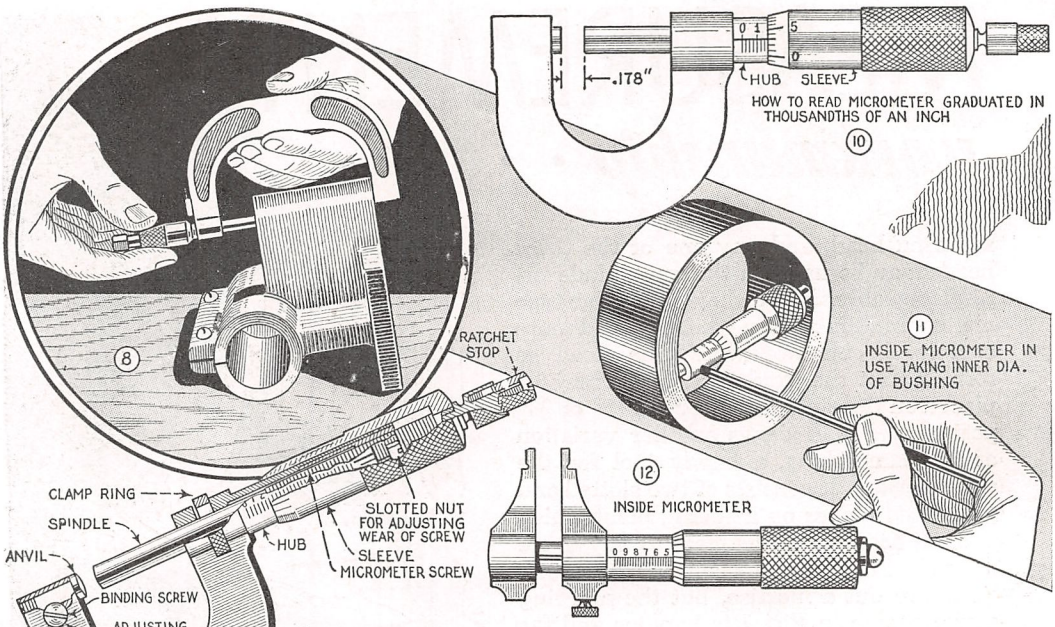
squaring head, and any one of the three heads may be used on the same blade interchangeably. Fig. 3 shows a similar type of combination square which is used more exclusively on woodwork, the head so formed that the graduated blade may be placed on the stock in either the 45° or 90° positions. Fig. 4 shows another variation of the same thing, a handy tool for the woodworker. It consists of two slotted and graduated blades on a sliding pivot which permits accurate adjustment to any angle desired. You can use a square and a pencil to lay out a mortise, but the marking gauge shown in Fig. 1 is handier and far more accurate. This tool will also serve as a depth gauge. The flexible rule, Fig. 5, provides a quick means of accurately measuring a circumference as well as the length or width of flat or curved work. Like many other measuring devices the trammel, Fig. 6, can be used for fine layout work on either metal or wood. Patternmakers, diemakers and machinists make extensive use of this tool.

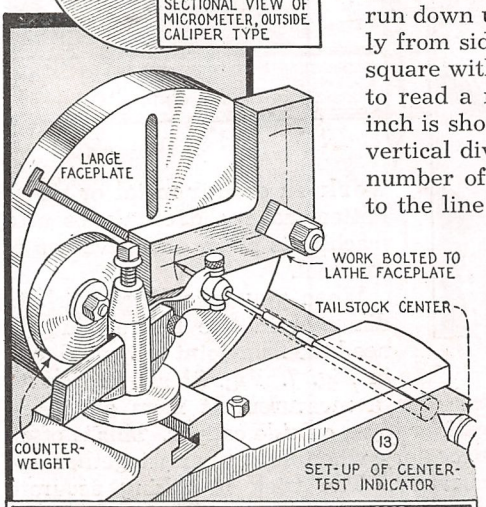
MACHINISTS' BEAM TRAMMEL USED IN SCRIBING CIRCLES, SEGMENTS AND IN TRANSFERRING MEASUREMENTS
⑥

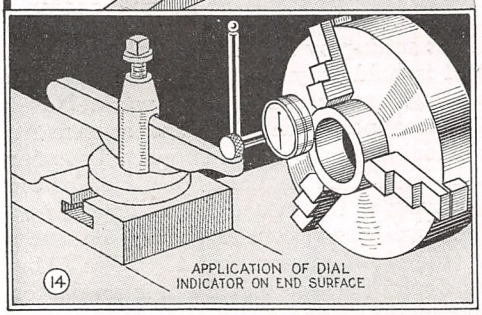




When you turn large work to diameter in the lathe you will need the firm-joint calipers shown in Fig. 7. Fig. 21 shows how to transfer a measurement from an inside caliper to an outside caliper. This is often necessary when fitting parts together accurately. The trick in taking accurate measurements with any caliper is first an exact setting by means of a rule, then the tool is held very lightly in the fingers as the legs are passed over the work. Never grip a caliper when taking a measurement; the tool must always be supported as near the ends of the fingers as possible, for the accuracy of the measurement depends on the sensitivity of your finger tips. The same is true of the micrometer, Figs. 8 to 12 inclusive. First, see that there is no dirt on the anvil or spindle and clean the work at

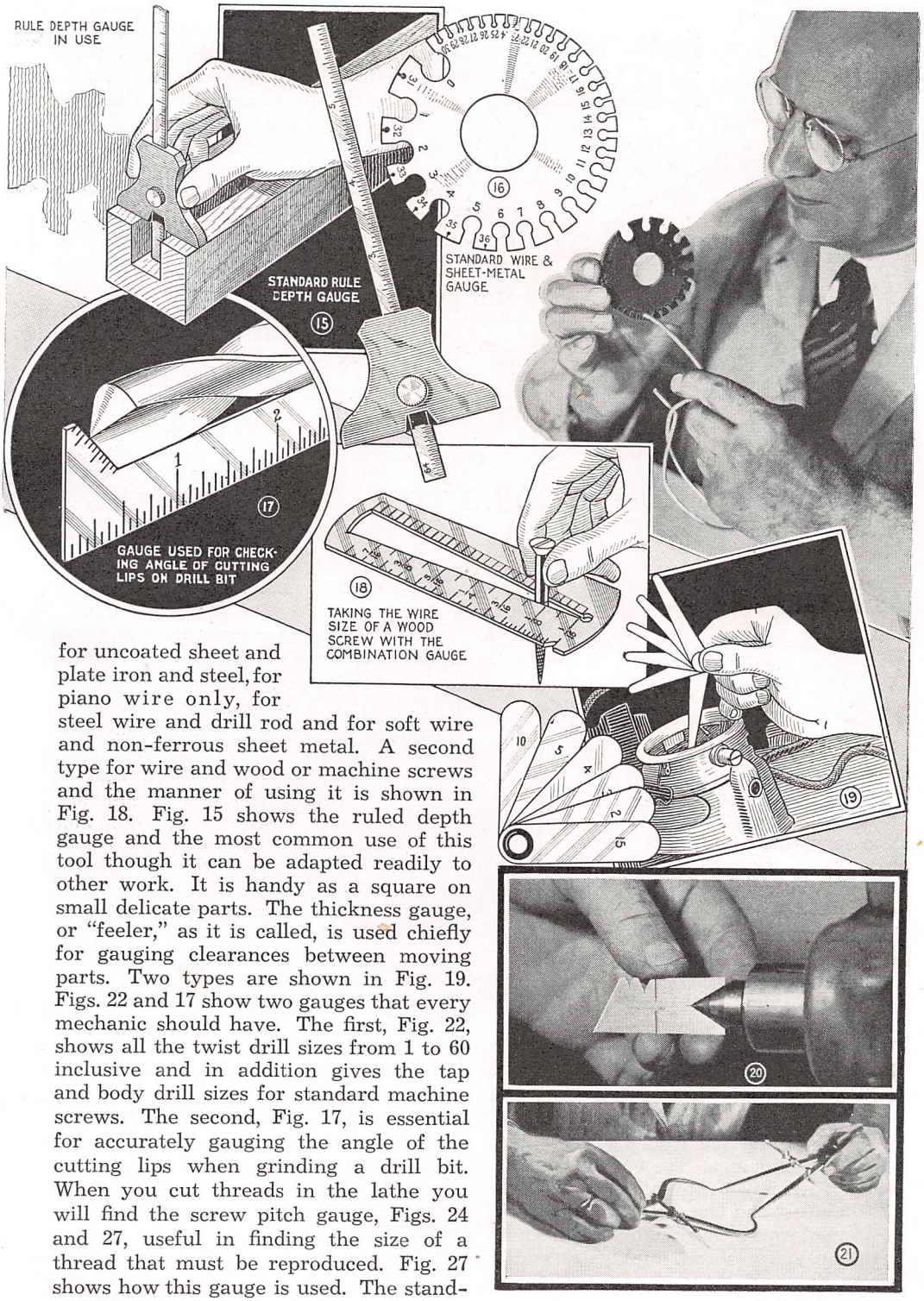




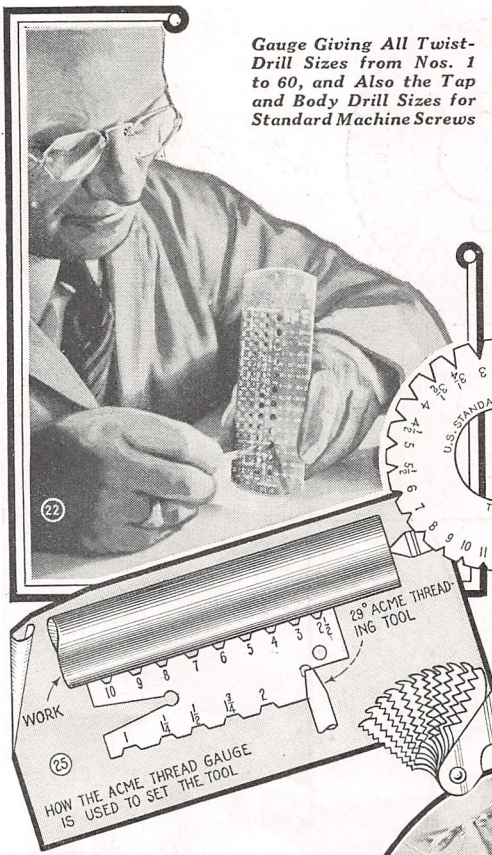


the point where the measurement is to be taken. Then the micrometer is placed over the work and the sleeve run down until the ratchet clicks. Move the tool slightly from side to side to make certain that the spindle is square with the work, and then remove carefully. How to read a micrometer graduated in thousandths of an inch is shown in Fig. 10. First multiply the number of vertical divisions visible on the hub by 25 and add the number of divisions on the bevel of the sleeve from 0 to the line which coincides with the horizontal line on the hub. For example, in Fig. 10, there are seven divisions visible on the hub and three divisions on the sleeve—hence 7 times .025 is .175 plus .003 equals .178, that is, the micrometer shown is open one-hundred-seventy-eight-thousandths.

Fig. 13 shows how the center-test indicator is used to center irregular work in the lathe. The centers are prick-punched on the work and the set-up is made as shown. The lathe is revolved by hand and the work adjusted on the faceplate until the long pointer remains stationary. The dial-test indicator, Fig. 14, is similarly used to detect errors on a machined surface. Figs. 16 and 18 show two types of combination gauges for measuring wire, sheet metal and either wood or machine screws. The first, Fig. 16, is used in gauging the thickness or diameter of both wire and sheet metal. It is made in several standards, such as the commercial gauge



for uncoated sheet and plate iron and steel, for piano wire only, for steel wire and drill rod and for soft wire and non-ferrous sheet metal. A second type for wire and wood or machine screws and the manner of using it is shown in Fig. 18. Fig. 15 shows the ruled depth gauge and the most common use of this tool though it can be adapted readily to other work. It is handy as a square on small delicate parts. The thickness gauge, or "feeler," as it is called, is used chiefly for gauging clearances between moving parts. Two types are shown in Fig. 19. Figs. 22 and 17 show two gauges that every mechanic should have. The first, Fig. 22, shows all the twist drill sizes from 1 to 60 inclusive and in addition gives the tap and body drill sizes for standard machine screws. The second, Fig. 17, is essential for accurately gauging the angle of the cutting lips when grinding a drill bit. When you cut threads in the lathe you will find the screw pitch gauge, Figs. 24 and 27, useful in finding the size of a thread that must be reproduced. Fig. 27 shows how this gauge is used. The stand-



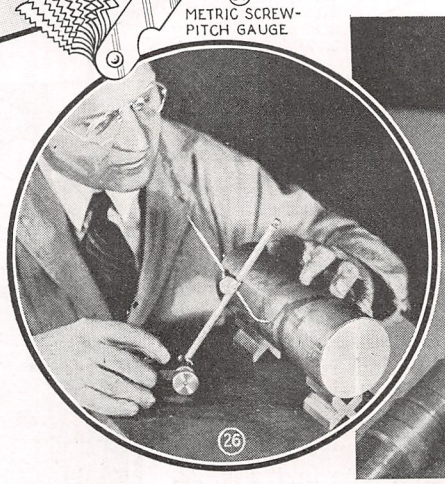
Gauge Giving All Twist-Drill Sizes from Nos. 1 to 60, and Also the Tap and Body Drill Sizes for Standard Machine Screws

(22)

(23) GAUGE USED TO DETERMINE PROPER ANGLE OF THREADING TOOLS

(24) METRIC SCREW-PITCH GAUGE

(25) HOW THE ACME THREAD GAUGE IS USED TO SET THE TOOL



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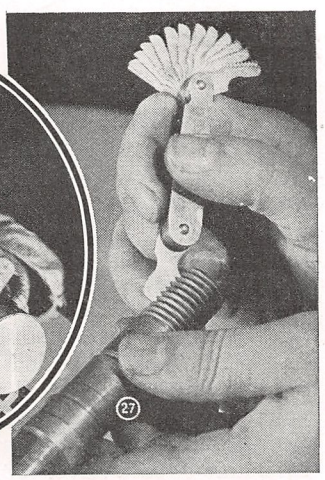


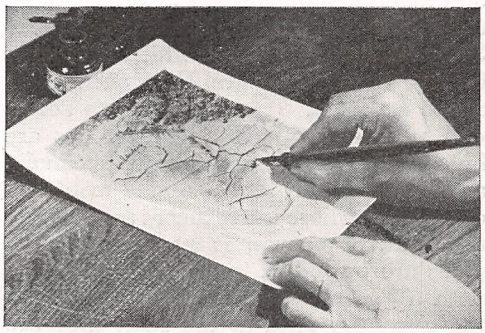
(27)

When working with precision measuring tools, acquire the habit of handling them carefully and always support the tools with the fingers only. Be sure, when taking measurements on metal, that the surface is clean and see that there is no dirt or metal chips on the measuring tool. In precision work the presence of grease and chips between meeting surfaces is a frequent cause of costly errors. Using the proper tool on work that requires extreme accuracy is important. In the hands of a skilled workman, the ordinary caliper will detect very slight errors. It can also be used to bring parts to a reasonably close fit. Yet this tool can in no way approach the micrometer caliper in precision measurement. Likewise, it is impossible to substitute a rule and scriber for the surface gauge in laying out

ard thread tool gauge in Fig. 23 and the Acme thread gauge, Fig. 25, are necessary when you must turn out an accurate piece of work to a given specification. The surface gauge, Fig. 26, is used for layout work on irregular surfaces that will not permit the use of other measuring tools. The mechanism of the lathe will take care of the pitch if properly adjusted but it is essential that you have your threading tool ground to precision limits. To accomplish this the tool must be ground to the angles of a precision gauge. The condition of the lathe centers is of the first importance when cutting and chasing threads. Before beginning work, check the lathe centers with the gauge shown in Fig. 20 and if necessary re-grind the centers to the correct angle.

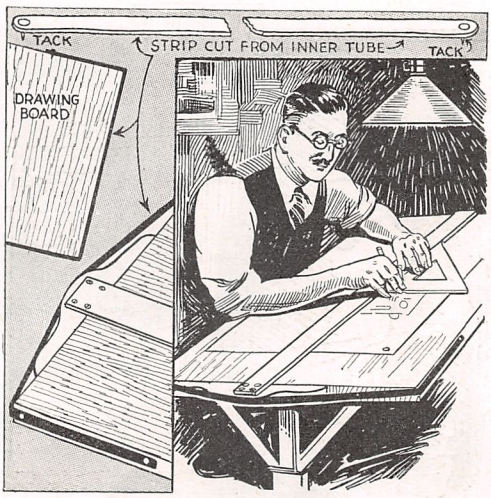
irregular-shaped work. It is well to check measurements over before beginning work and record on paper each measurement taken as the work progresses. When you measure round work with calipers, the tool should be held at right angles to the work, as otherwise an appreciable error will result. Keep an oily rag or a bit of clean oiled waste handy and wipe off the tools when you finish using them. A rusty precision gauge or micrometer is useless.

Two Useful Ideas for Artists and Draftsmen



When it is necessary to put lettering on a photo or to make a pen-and-ink copy of it, yet leave its appearance unmarred, stretch a sheet of clear Cellophane over the face of the photo and use India ink. The Cellophane may be cemented to the back of the photo near the top edge, and then folded over the face.

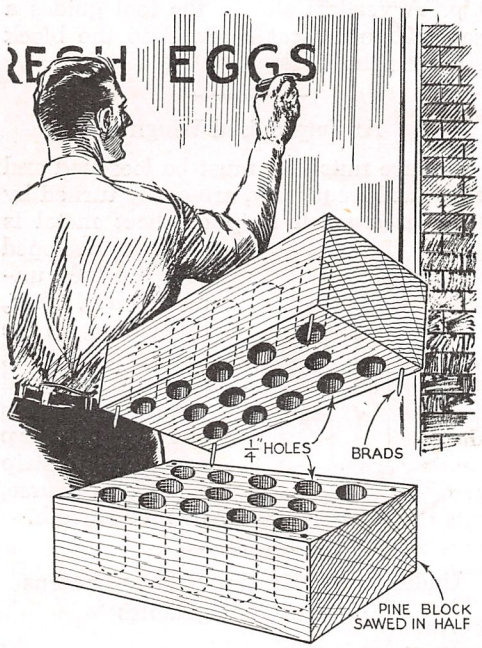
To save time and help to assure accuracy when using a T-square, some artists and draftsmen tack a strip of inner tube



across one edge of their drawing board as shown. The rubber holds the square snugly against the edge of the board and prevents it from slipping off, if the board is set at an inclined position.

Preparations That Make Colored Pencils to Write on Glass

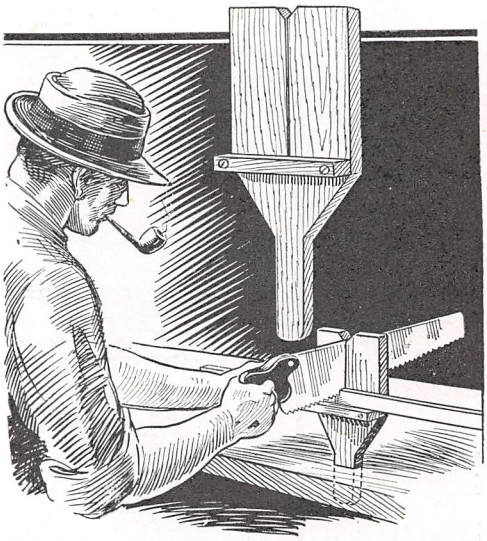
Colored pencils for writing on glass are easily made with the following mixtures, which are cast in a mold: To make black pencils, mix lampblack, 10 parts, white wax, 40 parts, and tallow, 10 parts. For white pencils, mix white lead, 40 parts, white wax, 20 parts, and tallow, 10 parts. If Berlin blue, 10 parts, is substituted for the white lead in the last preparation, the pencils will be blue. Or, they may be made yellow by using chrome yellow, 10 parts, instead of the lead. To make dark blue pencils, mix Berlin blue, 15 parts, lampblack, 1 part, gum arabic, 5 parts, and tallow, 10 parts. In mixing the preparations, first melt the wax and tallow together and then add the pigment. A mold for casting the pencils is made from a soft-pine block, which has several ¼-in. holes drilled in it. The block is then sawed in half and fastened together with brads so that it can be taken apart to remove the pencils.—Herman Myers, Worcester, Mass.



Wooden Mold Made by Drilling Holes in Pine Block to Form Colored Wax Pencils for Use in Writing on Glass

Rubbing a glossy varnish with a mixture of oil and pumice stone will dull it.

Simple Tool Aids in Sawing Lath Strips

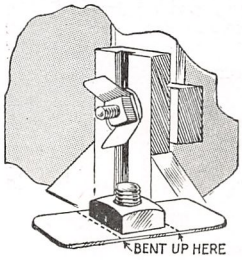


Much Time Is Saved in Squaring and Sawing Lath by Using This Tool

To save time in squaring and marking small lath strips for sawing, one worker used the squaring tool, which was made from a scrap piece of 1 by 6-in. stock. In use it is set in a slot cut in the workbench top. A vertical slot in the tool guides a saw, while a cleat screwed to the block supports the work

An Improvised Wingnut

Square nuts that must be loosened and tightened frequently, are easily turned by hand if a small strip of sheet metal is drilled and slipped over the bolt, under the nut. Then, by bending up the ends of the strip, an improvised wingnut is formed. Sharp corners of the strip should, of course, be filed smooth.

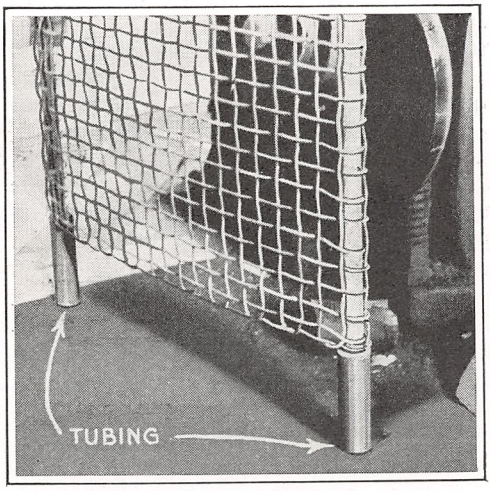


Underground Heating System Hastens Growth of Vegetables

In order to market his vegetables early in the spring while prices are high, an Oklahoma farmer hastens the growth of the plants by warming up the winter-chilled ground in his garden with an underground heating system before planting the seeds. The garden is made into beds 30 by 36 ft. in size under which lengths of 6-in. pipe are laid parallel to each other and 3 ft. apart. The furnaces are set at one end of the pipes and chimneys are built at the other end to draw the smoke and heat through them. At the front end of the beds where the furnaces are located, the heat, of course, is greater and the pipes are buried 21 in. under the ground with a general incline as they approach the chimneys until at the rear, they are only 5 in. under the ground. As an added protection, sawdust is placed 4 or 5 in. deep over the beds and removed just before planting time.—Frank Reynolds, Ft. Morgan, Colo.

Tubing in Shop Floor Supports Safety Guards in Front of Machines

In a shop where wire-mesh safety guards are used in front of some machines, short pieces of pipe or tubing, imbedded in the concrete floor, provide good sockets for supporting the guards, which may be removed when the machines are not in use.

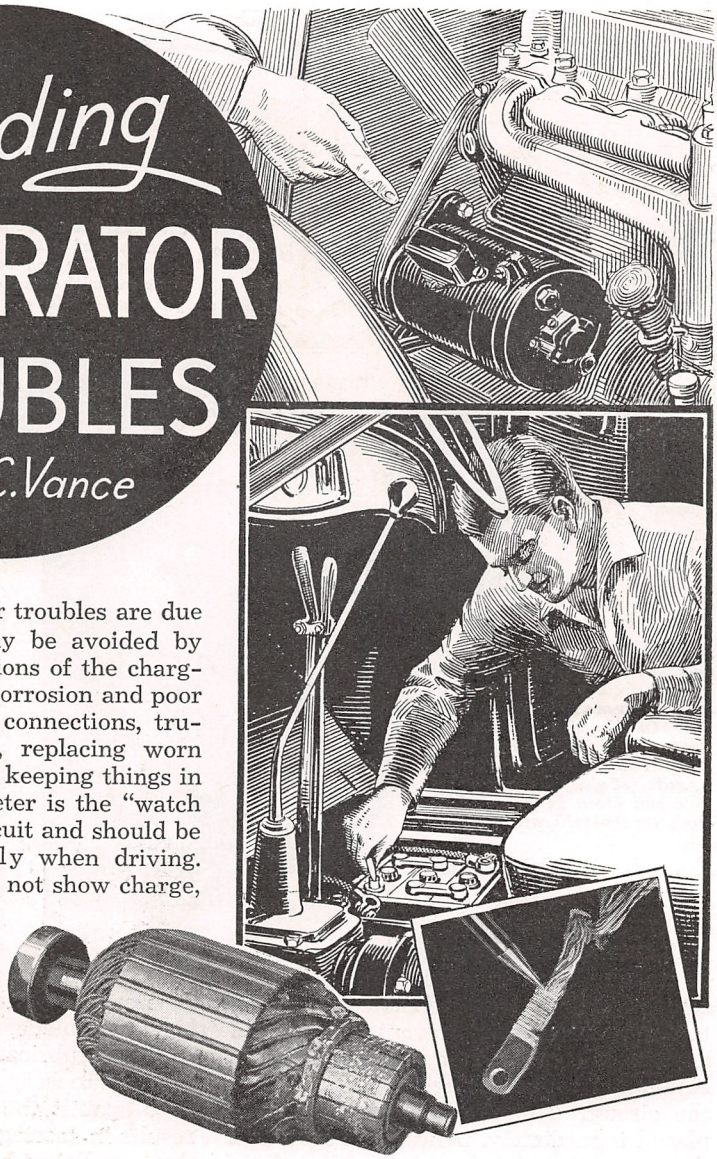


Safety Guards in Front of Shop Machines Supported by Tubing or Pipe Imbedded in Floor

This idea is especially handy in shops where the floor space is crowded with machines. The sockets may project above the floor or they may be flush, with a small hinged cover to keep out dirt.

Avoiding GENERATOR TROUBLES

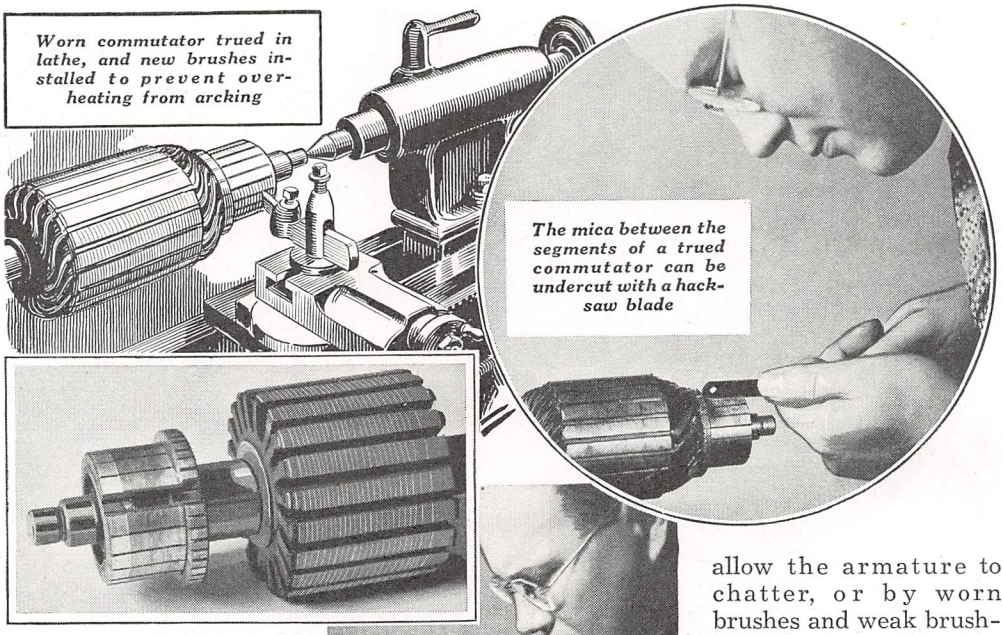
by A.C.Vance



MANY auto-generator troubles are due to neglect and may be avoided by making periodic inspections of the charging circuit, eliminating corrosion and poor contact at all electrical connections, truing worn commutators, replacing worn bearings, and, generally, keeping things in shape. Your dash ammeter is the "watch dog" of the charging circuit and should be glanced at occasionally when driving. When the ammeter does not show charge, it indicates trouble in the circuit. First look at the generator commutator to see if it is clean and bright. Grease and carbon on the commutator prevent the brushes from making good contact. To remedy this condition hold fine sandpaper against the commutator while it rotates. Never use emery cloth as this may damage the bearings. If the commutator is in good condition, remove the cover from the electrical cutout, usually located on the generator housing, and see if the points close to allow passage of current. If you find trouble in either generator or cutout but cannot correct it immediately, ground the generator at once by connecting a wire from the output terminal to a convenient bolt on the motor. If this is neglected, an excessive amount of current is forced through the field windings, which will over-heat them and probably cause them to burn out, unless they are protected with a fuse.

Corroded and frayed battery cables and terminal posts resist passage of current and may cause generator to burn out. Evidence of solder on the commutator indicates over-heating caused by resistance in charging circuit

Battery terminals are another source of generator damage as corrosion on the terminals produces high resistance to the current, which forces an abnormal amount



Above, badly worn generator bearings allow armature to rub against field-pole pieces scoring the armature core, while shifting brush holders may loosen commutator segments. Right, when there are no short circuits, slightly burned windings can often be repaired by applying several coats of shellac

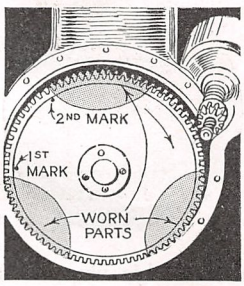
through the field windings, with resulting damage just mentioned. Corroded terminals should be scraped clean to assure good electrical contact. A frayed ground cable will, owing to its reduced size, prevent the normal amount of current from passing, which is equivalent to increasing the resistance in the circuit. Therefore, it should be replaced immediately. Always be sure that the connections of the wire leading from the electrical cutout to the starter switch are tight as this is the conductor for the current from the generator to the battery.

If, on examining the generator, you find melted solder thrown from the commutator where the armature wires are connected, it is a direct result of the commutator over-heating which is caused by high resistance in the line or poor contact of the brushes on the commutator. The latter condition may be caused by mica strips projecting beyond the surface of the commutator segments, by worn bearings, which allow the armature to chatter, or by worn brushes and weak brush-holder springs. If no other damage has resulted, re-soldering can be done, but the job must be finished cleanly so that the segments are well insulated from each other. However, if over-heating is due to high mica or a worn commutator, the latter should be trued on a lathe and the mica under-cut below the surface of the segments. This can be done with a piece of broken hack-saw blade, if handled carefully. Insufficient lubrication sometimes allows the bearings to wear so that the armature core rubs against the field pole pieces, which results in scoring the core, and often produces sufficient heat to burn the windings. Brush holders of certain types sometimes shift and drag on the commutator, resulting in serious scoring, and even loosening of one or more of the segments. Pressure of auto-generator brush springs ranges from 12 to 16 oz. If the pressure exceeds this, friction of the brushes against the commutator will cause over-heating. On the other hand, if the pressure is insufficient, arcking between brushes and commutator will over-heat the latter.

In case of an over-heated generator, the winding may have been burned slightly,

without causing a short circuit. It is then possible to re-insulate the wire by applying several coats of shellac, allowing each coat to dry under fairly high heat conditions. If two bared wires touch each other, a repair can often be made by prying them apart and slipping a piece of insulating cloth between them and then applying a heavy coat of shellac to hold the cloth in place.

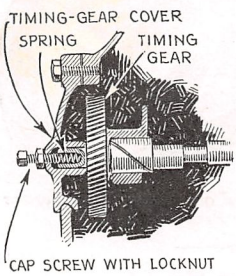
Shifting Gear on Flywheel Prevents Starter from Locking



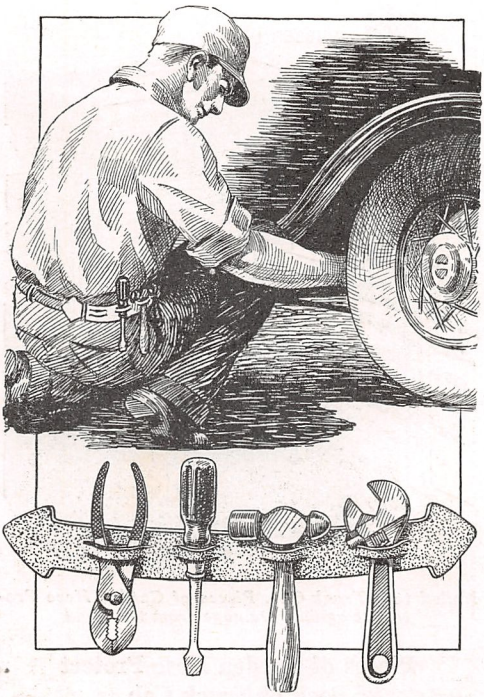
When the teeth on the flywheel of a car motor become worn so that the starter locks, one mechanic makes a repair by simply shifting the ring gear around the flywheel so that the starter engages unworn teeth. He finds that this method works on practically all cars as the starter gear usually engages the flywheel in one of four, six or eight places, depending on the number of cylinders in the motor. This, of course, is due to the fact that the motor usually stops at the start of a compression stroke on one of the cylinders. —Edgar H. Luck, Orillia, Ont., Can.

Eliminating Knock in Cam Shaft of Model-A Fords

Some model-A Fords have an idling knock caused by a warped timing gear, which moves the cam shaft back and forth as it rotates. To eliminate the knock, I tap a hole in the timing-gear cover and insert a 7/16-in. cap screw so that it bears against the spring at the end of the shaft. A lock nut keeps the screw from turning.—J. L. Baker, Cooper, Tex.



¶When installing car fenders, put all the bolts in place before tightening any of them.

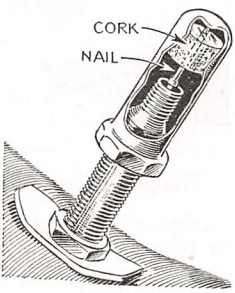


Shaped Like Arrowheads, Ends of This Tool Belt Readily Engage Loops on Your Trousers

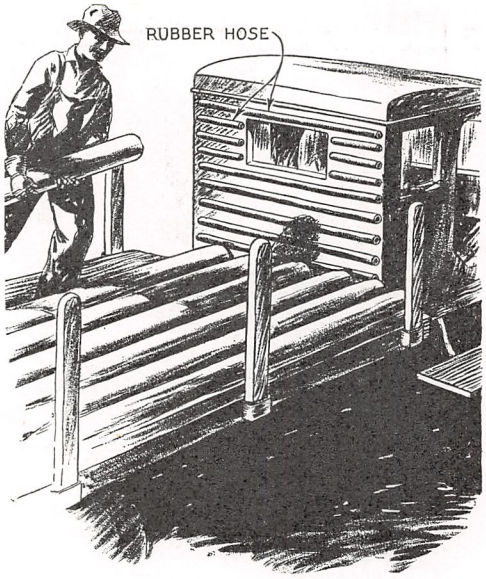
Tool Belt Is Quickly Attached or Removed

Filling-station operators, garage mechanics, linemen and others who have occasion to don a tool belt hastily for small jobs, will find this one easy to attach or remove. A leather strap is slit at intervals to provide loops for the tools, and the ends are cut to the shape of arrowheads for easy insertion through the belt loops on your trousers.

Altered Valve-Stem Cap Deflates Tire



An auto mechanic who does tire repairing has found this deflater highly satisfactory. It is merely an old valve cap fitted with a cork in which a nail is driven to depress the valve when the cap is screwed onto the stem. A small hole in one side of the cap lets the air escape.



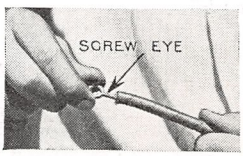
Nailed to a Truck Cab, Pieces of Garden Hose Protect It against Damage from the Load

Pieces of Garden Hose Protect Back of Truck Cab

To protect the back of his truck cab, one owner recommends using pieces of old garden hose. These are spaced about 6 in. and nailed or bolted horizontally to the back of the cab as shown. The hose cushions the back of the cab so that when any part of the load jams against it, the cab is not broken or cracked.

Screw Eyes Serve as Terminals on Spark-Plug Cables

Emergency terminals for spark-plug cables on marine, auto, or motorcycle motors may be made from small brass screw eyes. These are merely screwed into the ends of the wires where they will hold securely.—C. E. Packer, Chicago.

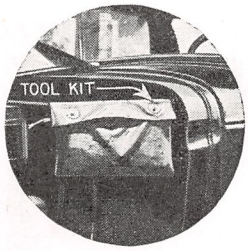


Drop-Center Rims Cause Punctures

Mysterious punctures which often occur in inner tubes on drop-center rims are sometimes due to a defect in the rim itself. This type of puncture is generally caused by shrinkage or displacement of the fabric strip that is cemented to the bottom of the drop center which allows the tube to be pinched between the strip and rim, or to make direct contact with rust along the side of the strip. A permanent remedy can only be had by replacing the damaged fabric strip with a new one.

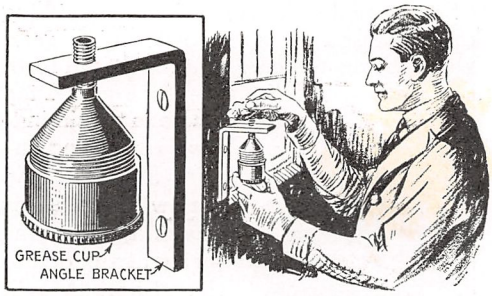
Small Tools Carried on Radiator Tie Rod

Small tools that are used frequently around the car are most conveniently carried in a small tool kit fastened to one of the radiator tie rods. The kit should have a large flap, which is folded over the rod where it is held with three or four strong snap fasteners of the kind used on auto curtains. In this way, it is unnecessary to disturb the passengers to get a small wrench, screwdriver or a pair of pliers.—W. Waldemar, Millbrae, Calif.



Prussian-Blue Dispenser for Mechanics

Mounted on the wall near a workbench, a large grease cup will be found handy in a garage or shop for dispensing prussian blue. The threaded end of the cup is screwed into a tapped hole in an angle bracket, which is in turn screwed to the wall.



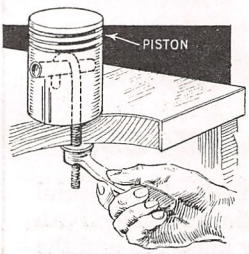
Large Grease Cup Mounted on Garage Wall Serves as Dispenser for Prussian Blue

Installing Cylinder-Head Gaskets

Considerable time and labor can be saved when installing new cylinder-head gaskets on Chevrolet cars if two men are

put on the job. First remove the spark plugs, push-rod cover and both rocket-arm shafts. Then pull the rocker oil line down through the head and take out all the push rods, placing them in order so that they can be put back on the same tappets from which they were removed. Next remove all the cylinder-head bolts and then have one man raise the left side of the head. A couple of screwdrivers will serve as handles for this purpose. The other worker raises the right side of the head by means of a heavy punch which is inserted in the No. 4 spark-plug hole. He then removes the old gasket with one hand and pushes the new one in place with the other hand. Re-assembling the head and tightening the bolts completes the job.—J. L. Baker, Cooper, Tex.

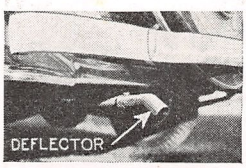
Simple Tool Holds Pistons to Install New Rings



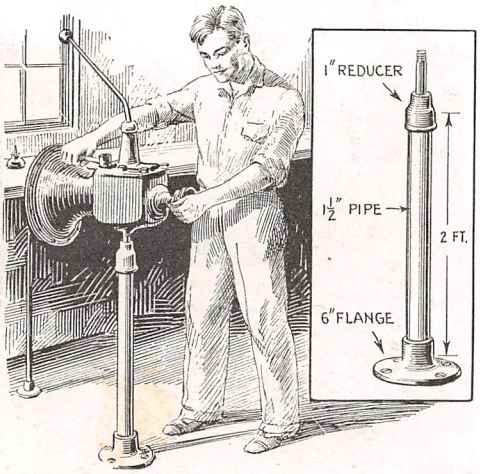
Here is a cheap, efficient clamp to hold pistons when installing new rings. It is an iron rod threaded at one end for a nut and bent to form a hook at the other end. In use, the hooked end is slipped over the wrist pin, after which the rod is inserted into a hole in the workbench top and the nut tightened, using a washer to prevent the nut from biting into the wood.

Deflector for Chevrolet Exhaust Pipe

To prevent the rear part of the body on my late-model Chevrolet from being sprayed with soot and grease from the exhaust pipe, which is turned upward slightly at the end, I clamped a tin deflector to the end of the pipe. The lower half of the deflector is cut out so that there is no tendency to clog the exhaust pipe.—Colin Kerr Cameron, Sunnyside, L. I., New York.



Transmission Stand Made of Pipe

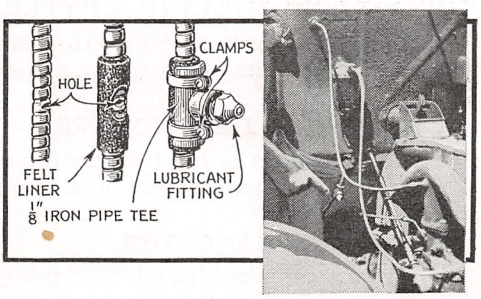


Assembled from Pipe and Fittings, This Stand Simplifies Auto-Transmission Work

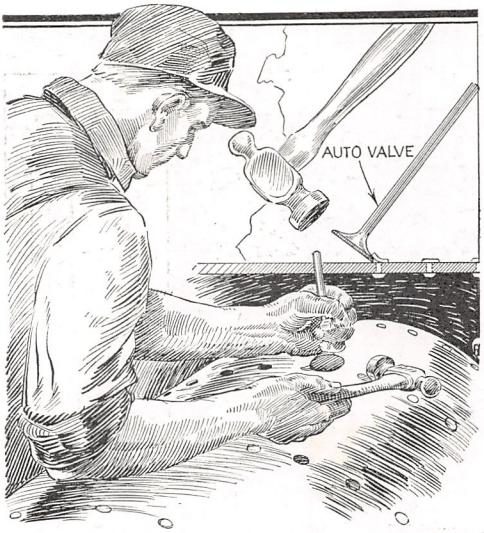
Here is a stand that will take almost all transmissions. It is merely a length of pipe fitted at the lower end with a floor flange, and at the upper end with a reducer to take a short 1-in. pipe nipple, which is threaded to screw into the drain hole in the transmission. The stand is fastened to the floor with lag screws or expansion bolts.—James W. Clift, Columbus, O.

Improvised Attachment Lubricates Speedometer Cable

One car owner has found that an efficient method of lubricating a speedometer cable is to use a split pipe tee, which is provided with a lubricant fitting as shown. The tee is clamped over a small hole filed in the speedometer cable, using a felt liner or sleeve as a seal between the cable and tee. Light grease that contains graphite is recommended for lubricating the cable.



Speedometer Cable Greased with Attachment Which Is a Pipe Tee Provided with a Lubricant Fitting



Old Auto Valve Will Be Found an Efficient Rivet Cutter When a Cold Chisel Is Unavailable

Auto Valve Used to Cut Rivets

Used in the manner indicated, an old valve from a car motor will serve efficiently as a rivet cutter when a cold chisel is not at hand. The metal in these valves is hard and can be used to remove many rivets before the cutting edge becomes dull.

Adhesive That Sticks Celluloid to Metal or Wood

A strong adhesive for fastening celluloid to wood or metal is made by dissolving shellac, 2 oz., in denatured alcohol, 4 oz., and adding spirits of camphor, 3 oz., after which the mixture is allowed to stand overnight in a tightly closed container. If all of the shellac has not been dissolved, the mixture should be cautiously warmed over a water bath away from an open flame while stirring.

The Next Issue

PLASTER NOVELTIES CAST IN FLEXIBLE MOLDS

It's fascinating pastime to cast plaster novelties in flexible molds. Many useful and ornamental articles, such as book ends, wall plaques, flower holders, ash trays, etc., can be made in this way. The technique is easily mastered and the items, finished in attractive colors, can be sold at a handsome profit.

MIRROR FRAMES IN TRUE COLONIAL STYLE

You can make a copy of the mirror that once hung in Longfellow's Wayside Inn. Other styles, including Chippendale and Queen Anne designs, also shown.

STAGE SETS FOR AMATEUR PLAYS

Simplified construction of stage sets for amateur theatrical productions. The equipment described was used in high schools of Pasadena, Calif.

REGRINDING MILLING CUTTERS

Milling-cutter teeth can be re-sharpened without annealing—a process which is being successfully used in a number of large American manufacturing plants.

A RECORDING THERMOMETER

How uniform is the temperature in your home? A recording thermometer gives an accurate record of temperature variations over twelve-hour periods.

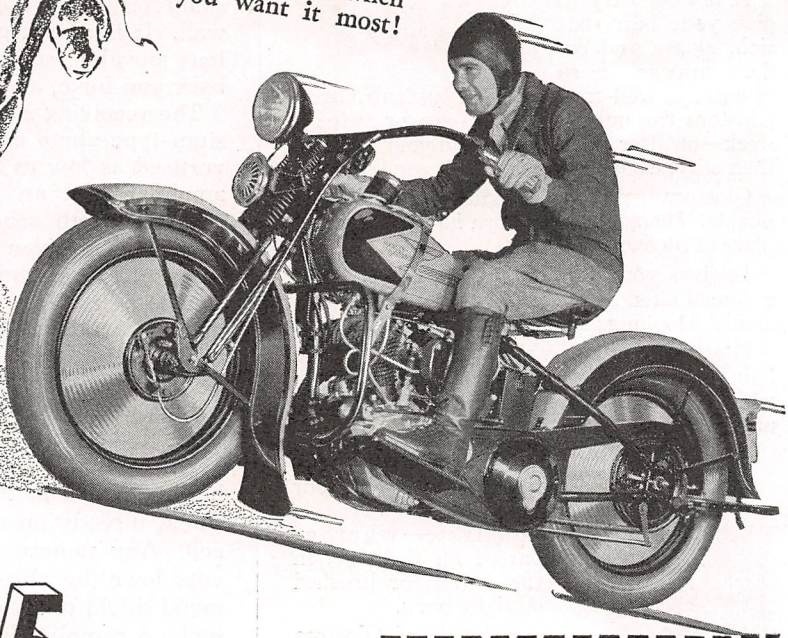
HOW TO USE HANDSAWS

Expert describes the tricks of using your handsaw in order to make accurate cuts efficiently, and what kind of saws to use on certain types of work.

Riding the PONY EXPRESS!

HARD riders — those men of the pony express. Urging foam-flecked ponies over winding trails. "Make time" — was the watchword of those daring men of other days.

And "make time" is the slogan of Harley-Davidson riders today. Their tireless mounts need no urging. A twist of the throttle—and the new '35 Harley-Davidson takes you whizzing along the trail hour after hour. It's got what it takes for thrill-riding. Plenty of get-away — speed — stamina — and high-stepping style. No need longing to own one. Ask your Harley-Davidson dealer about his Easy-Pay Plans. Then have your Harley-Davidson NOW — when you want it most!



1935 HARLEY-DAVIDSON

Mail this Coupon

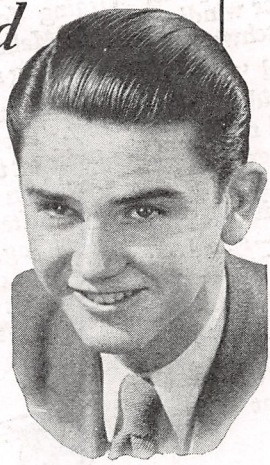
Harley-Davidson Motor Co., Dept. P., Milwaukee, Wis.
Interested in new 1935 Harley-Davidson.
Send illustrated literature. Enclosing postage stamp to cover mailing cost.

Name_____

Address_____

My age is ( ) 16-19 years, ( ) 20-30 years, ( ) 31 years and up, ( ) under 16 years. Check your age group.

UNRULY HAIR -Now Neatly Combed



Costs but a few cents to use—

IS YOUR HAIR difficult to keep in place? Does it lack natural gloss and lustre?

It is very easy to give your hair that rich, glossy and orderly appearance so essential to well-groomed boys. Just rub a little Glostora through your hair once or twice a week—or after shampooing, and your hair will then stay, each day, just as you comb it.

Glostora softens the hair and makes it pliable. Then, even stubborn hair will stay in place of its own accord.

It gives your hair that natural, rich, well-groomed effect, instead of leaving it stiff and artificial looking as waxy pastes and creams do.

Glostora also keeps the scalp soft, and the hair healthy by restoring the natural oils from which the hair derives its health, life, gloss and lustre.

A bottle lasts for months

Try it!—See how easy it is to keep your hair combed—any style you like—whether parted on the side, in the center, or brushed straight back.

A bottle of Glostora can be bought for a trifle at any drug store and will last for months.

Glostora
FOR THE HAIR

HOW TO CHAT OVER A LIGHT BEAM

(Continued from page 423)

of the magnetic variety as the speaker is replaced by an ordinary head phone with a specially prepared diaphragm for modulating the light beam. The hard-rubber cap is removed from the head phone, and the center is cut away as shown in the sketch. The metal diaphragm is slipped off and taken to any plating firm to be finished in the same manner as an auto headlight reflector. The completed unit is assembled in the wooden frame as shown in the photo. A 32-candle-power auto headlamp is mounted on a separate block of wood placed about 1½ in. from the silvered diaphragm and should be movable for proper focus.

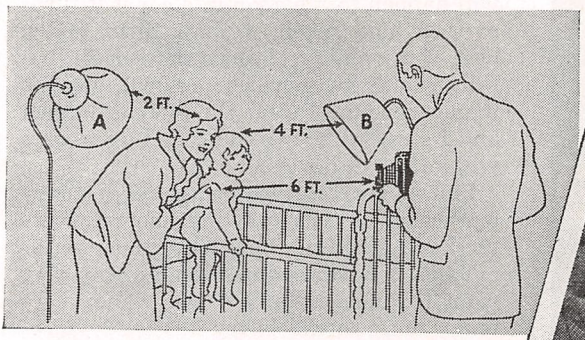
A 3½-in. lens, or reading glass, is mounted in the opposite end of the case which is about 12 in. long. Removable sides can be used on the case if desired. The lamp should be placed in a position so as to reflect the light from the silvered diaphragm to the lens. Practice focusing to obtain a small bright spot of light on a near-by wall. It is also a good plan to have the lens movable, so that it can be adjusted back and forth, as well as the lamp.

The receiving station consists of a caesium-type photo cell, (good cells are advertised as low as $3.00) a 3-stage audio amplifier and an inexpensive magnetic speaker. Both schematic and simplified diagrams are given for this amplifier, also the necessary battery hook-up. The parts can be assembled on a small breadboard or on a metal base, 2¼ in. high, 8 in. wide and 10½ in. long, as shown in the photo at upper right. The photo-cell, and its socket, are housed in a metal box to exclude light from sources other than the beam from the sending station. A ⅜-in. hole is drilled in the hinged front of this shield directly on a line with the photo-cell. Any unnecessary light on the cell cuts down the efficiency of reception. The metal shield box is 4¼ in. square and 6 in. high. A complete list of materials and additional construction data may be obtained upon application, without charge.

When both units are ready for operation, the photo-cell is placed in the modulated light beam for preliminary tests. At a distance of 1,000 feet it is necessary to use a lens at the receiving station to con-

(Continued to page 120A)

Here's a snapshot you can make *Tonight*



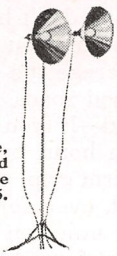
HERE'S ALL YOU HAVE TO DO

Use Kodak "SS" Film. Set your camera for 1/25 second. Open the lens to *f*.6.3. Put 1 Mazda Photoflood bulb in lamp A—2 in lamp B. Distances as indicated. Sight the subject, click the shutter—and you've made the picture.

ALL YOU NEED FOR SNAPSHOTS AT NIGHT

KODAK "SS"—the lightning-fast film, with the green lightning flashes on the familiar yellow box—the film that, indoors or out, in any light, improves picture quality.

MAZDA PHOTOFLOOD BULBS give brilliant light . . . last for about two hours, enough for many pictures. Cost but 25¢.



KODAFLECTOR — Inexpensive, efficient . . . makes 2 Photoflood bulbs do the work of 9. Complete with stand, reflectors and cord, $5.

HOW much happens after sundown that would make treasured pictures. Now you can get them—easily—as so many others are doing. You can take snapshots indoors, at NIGHT.

Just use any camera with an *f*.6.3 (or faster) lens, loaded with Kodak Super Sensitive Panchromatic Film. This high-speed "SS" Film is three times as fast as Verichrome, six times as fast as ordinary film, under artificial light. Two or three Mazda Photoflood bulbs give ample light.

Hold the camera in your hands as you would outdoors, set it for 1/25 second, open the lens to *f*.6.3. Sight the subject, click the shutter. You've made a snapshot. *Indoors . . . at NIGHT.*

KODAK VOLLENDA (*f*.3.5) —a fine miniature camera. Takes sixteen 1 3/16 x 1 9/16 in. pictures on a roll of "vest pocket" film. Eight-speed Compur shutter . . . *f*.3.5 lens . . . eye-level finder. Ideal for snapshots at night. Price—$33.50.

ONLY EASTMAN MAKES THE KODAK

FREE . . . 32-PAGE BOOK

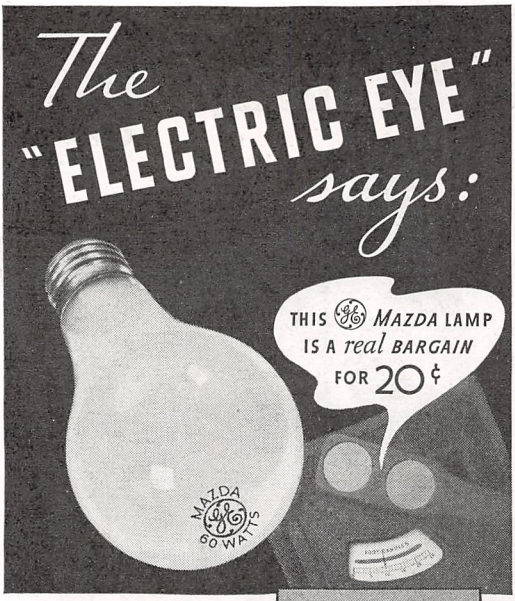
Here's a book you'll want in your library. Complete details about indoor pictures with Photoflood and Photoflash bulbs. Tells you how to make outdoor night pictures of lightning, lighted buildings, fireworks. How to make moonlight photos. Write to the Eastman Kodak Company, Rochester, N. Y.

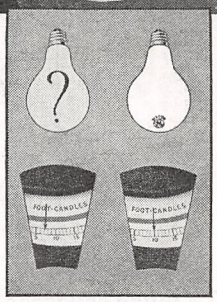
PM 3-35

Name_____

Address_____

City_____ State_____





Only through elaborate and expensive tests of thousands of lamps can lamp quality be accurately determined. Such tests show that there is a wide difference in light output between a good lamp and one of inferior make—often as much as 30 per cent. Since two lamps of equal wattage use exactly the same amount of current, why take chances with unknown lamps which may fail to produce all the light they should?

The poorly-made "bargain" lamp is no bargain, says the "electric eye." A lamp is only a bargain to this marvelous instrument when it delivers ALL the light it should for the current it consumes. General Electric MAZDA lamps do just that! You don't need the electric eye to see it or to be sure that you are getting a real bargain in light. Just look for the famous General Electric monogram GE. General Electric Co., Nela Park, Cleveland, Ohio.

25-40-60-watt MAZDA lamps are 20 cents.
The 100-watt size only 25 cents.

GENERAL ELECTRIC
MAZDA LAMPS

BREAKING THEM UP TO MAKE THEM BETTER

(Continued from Roto Section)

research. Motorists want to know what will happen to a person in a car if it turns over at high speed. I show them to the best of my ability. I am a dare-devil, but I don't take any more chances with my life than I have to. I wear the football helmet and I strap myself in the car. I drive cars with all-steel bodies.

Since I entered the strange topsy-turvy profession of thrill-making, motorists often have asked me how I turn over automobiles. I never can understand why they want to know because I know they certainly don't intend to try it.

Contrary to general belief, it is very difficult to turn over a modern automobile. Modern cars have low centers of gravity. They are constructed to hold the road. The engineers are improving them every year—making my job more difficult. I turn over a car by driving it at a high rate of speed and then swerving the wheel to throw the car off balance. This is difficult to do, even at seventy miles an hour. On several occasions, I have tried as many as three times before succeeding in turning over.

I'd much rather tell motorists how to keep their cars running upright than tell them how to turn the cars over. It's easier. I've learned a lot about skidding autos.

Here's my advice to you, as one who has survived hundreds of handmade accidents:

First—Never drive over fifty miles an hour. You don't have to speed these days to get where you are going. You can almost average the speed you travel on today's good roads.

Second—If you must travel over fifty miles an hour, hold your steering wheel with a firm grip. Never take your eyes off the road, even for a fraction of a second. At sixty miles an hour your car occupies 263 feet of roadway each second. Keep that in mind.

Third—If your car ever starts skidding, either on a slippery pavement or in loose gravel, forget that you have any brakes. Step on the accelerator. Let your car pull itself out of the skid. Then, apply the brakes and slow down.

¶Our Bureau of Information will answer questions regarding articles in this magazine, if accompanied by return postage.

$75 less motor drive

For the New South Bend

9" x 3' "Workshop" Lathe

BACK-GEARED, SCREW CUTTING, METAL WORKING

on Easy Payment Terms

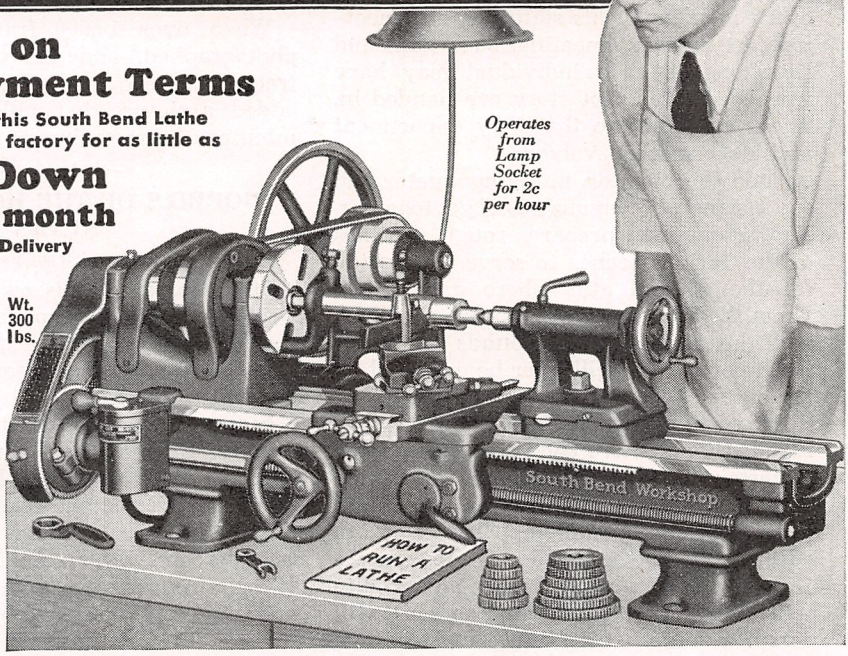
You can buy this South Bend Lathe Direct from the factory for as little as

$19 Down

$6.50 a month

Immediate Delivery

Operates from Lamp Socket for 2c per hour



THE new 9 1/8" swing by 3' bed "Workshop" Bench Lathe turns, faces, bores, cuts threads and performs all kinds of machining operations on cast iron, steel, all soft metals, wood, compositions and other materials. Has the power to reduce the diameter of a steel shaft 1/4" in one cut. Takes 18" between centers; weighs 300 lbs. Constructed entirely of cast iron and steel. It is a rigid, powerful, accurate, modern lathe.

FEATURES include back-geared headstock with six spindle speeds; cuts threads 4 to 40 per inch; has automatic longitudinal feed to carriage as fine as 350 per inch; graduated compound rest; 3/4-inch hole through spindle; three V-ways, one flat-way on bed; all gears machine-cut of steel and cast iron. It is a genuine South Bend Lathe, accurately built and recommended for the most accurate work. Satisfaction guaranteed or your money back.

PRICE of $75 includes bench lathe complete, as illustrated, but does not include motor drive. Price with motor drive, including 1/4 H.P. reversing motor and drum reversing switch as shown $94. Other bed lengths 3 1/2', 4' and 4 1/2' in Bench type and Floor Leg type, countershaft and motor drive at similar low prices.

USED by manufacturing plants, machine shops, government laboratories, schools and home shops. Used in Automotive service shops for armature work, valve refacing, machining pistons, making bushings, etc.

SEND in your order now with down payment for 30-day trial in your own shop. Lathe is shipped immediately on receipt of down payment. Small monthly payments will take care of the balance.

9 1/8" swing x 3' bed "Workshop" Bench Lathe with Horizontal Motor Drive **$94.00**
Complete with reversing motor and reversing switch as shown. Wt. 300 lbs.
$24.00 Down, Balance $7.00 a Month. Immediate Delivery.

LARGER SIZE LATHES 9" TO 18" SWING

South Bend Back-Geared, Screw Cutting Precision Lathes are built in ninety-six other sizes and types from 9-inch to 18-inch swing with Countershaft Drive and individual motor drive. Price range $140 to $1500. Prices of a few of the popular size lathes are listed below. Other sizes and bed lengths can also be supplied. If interested write for General Catalog No. 94—mailed postpaid to any address.

Popular Size Standard Change Gear Lathes	Mtr. Dr. Wt.Lbs. Crated	COUNTERSHAFT DR. Cash Price	Down Pay't	Mnth. Pay't	MOTOR DRIVE Cash Price	Down Pay't	Mnth. Pay't
18" x 10' Lathe	3300	$689	$135	$37	$879	$175	$45
16" x 6' Lathe	2195	480	100	29	622	125	34
16" x 8' Lathe	2355	520	108	31	662	135	37
15" x 6' Lathe	1975	430	90	26	570	115	34
13" x 5' Lathe	1440	352	75	25	485	100	29
13" x 6' Lathe	1490	367	75	25	500	100	29
11" x 4' Lathe	905	300	60	20	393	80	26
11" x 5' Lathe	975	312	65	22	405	90	26
9" x 3' Lathe	461	225	45	16	244	50	17
9" x 4' Lathe	511	215	50	17	264	55	19
9" x 3' Junior	416	170	35	12	188	40	13
9" x 3' Toolmaker	340	140	31	9	158	35	12

Free Bulletin on "Workshop" Lathe

Get a copy of this valuable and instructive 32-page catalog illustrating, describing and pricing the 9" "Workshop" Lathe and all its accessories and attachments. If interested in a larger lathe, also ask for General Catalog No. 94. Mailed free postpaid, to any address.

NRA **SOUTH BEND LATHE WORKS**

603 East Madison St., South Bend, Ind., U. S. A.

Lathe Builders Since 1906—Users in 97 Countries

SOUTH BEND LATHE WORKS
603 E. Madison St., South Bend, Ind., U.S.A.

Please send me free quotation and illustration on the following lathe:

Swing.....Length of Bed.....

Countershaft Drive.....Motor Drive.....

My work is.....

☐ 9-inch "Workshop" Lathe Bulletin (free)
☐ How to Run a Lathe (160 Pages) (25c)

Name.....

Address.....

City.....State.....

BREATHING LIFE INTO CARTOON CHARACTERS

(Continued from page 389)

Walt Disney, creator of Mickey Mouse and the Silly Symphonies, hands a mimeographed draft of the idea for a cartoon to every member of his staff at a gag meeting. At the next meeting, such gags and situations as each individual may have worked out for that story are handed in. These are given to the story department and a scenario is evolved.

Then the director, music conductor and set designer, or "layout man," get together. The layout man prepares rough sketches of the various scenes to serve as a guide for the general atmosphere and action. From these the backgrounds are sketched, and the finished backgrounds prepared. Such portions as will later be occupied by the animated figures are left subdued.

After the story has been mapped on a layout sheet, where each scene is allotted a certain number of feet, a production schedule is prepared and the scenes are given identifying numbers. The exposure sheet breaks the scenes down into terms of frames. On this, every frame is marked to indicate the exact sound and action it will carry. The music conductor's master sheet carries the same information.

Now the animator makes his progressive drawings, numbering them in the order in which they are to be photographed, and recording them on the exposure sheet as they are completed. He makes the drawings of the extreme action only, to serve as a guide to his assistant who makes the in-between drawings. Then the drawings go to apprentices, who fill in details. It takes about 15,000 of these drawings for the average short movie cartoon, 600 to 700 feet in length.

The drawings are traced in India ink into celluloid sheets seven by nine inches. The registering holes in these cells and those in the animator's drawings are placed together over registering pegs so the tracing, and the later position of the animated figure in respect to the background, will be accurate. After the tracing is completed, the cell is reversed and the figure is given a backing of opaque paint.

When all the cells are ready, they go to the photographer. The background drawing is placed first in the frame. Then the cells, each carrying one character, are laid down in place on registering pegs. Compressed air clamps a glass tightly over the cells, the lens shutter clicks, and the photographer is ready for the next set. Fifty feet of film, or 800 frames, is a good day's work. Nearly twice that many feet of sound track can be recorded in one minute.

When over 10,000 frames have been photographed, and the three-ply sound track has been made, put together, and added, a picture that will take just seven minutes of screen time is ready for you.

HOBBIES OF THE HOLLYWOOD STARS

(Continued from page 374)

that he makes at his own forge. Lionel Barrymore makes copper etchings. Nils Asther repairs antique furniture, and Roger Pryor builds and experiments with musical instruments.

Star-gazing is the part-time hobby of some of the stars and among the serious students of astronomy is Lew Ayres, who owns two refracting telescopes. Rod La Rocque has constructed a six-inch reflecting telescope with an equatorial mounting.

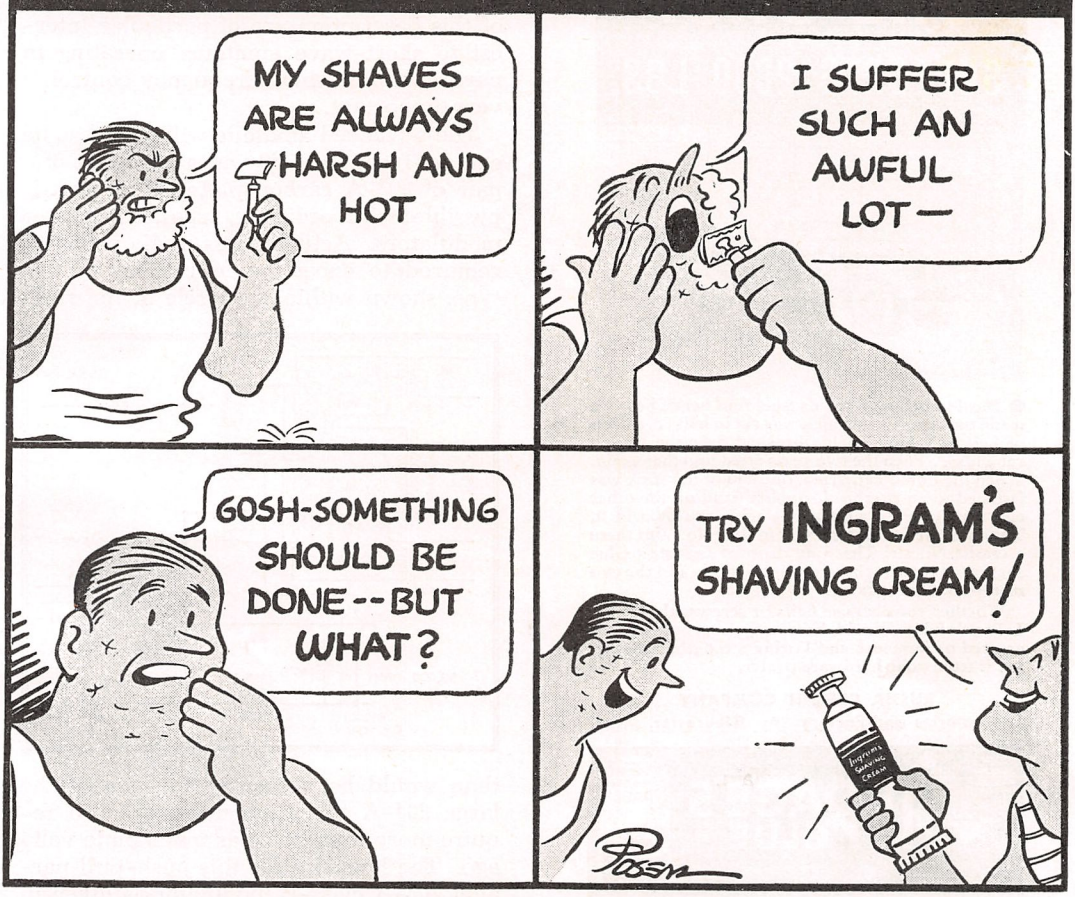
Gary Cooper is an amateur taxidermist and helped mount some of the heads that he brought back from an African hunting trip. Cooper also makes feathered Indian war bonnets in his spare time. Cecil B. De Mille collects old armor, weapons, and guns as a hobby, and Clark Gable, whose hobby is shooting, is an expert gunsmith. Richard Cromwell makes life masks of his friends, and Bing Crosby and Dick Arlen are short-wave radio "hams."

Stamp collecting is the hobby of some of the picture players, including Robert Graves, who specializes in United States issues, and Carl Laemmle, Jr., and Jean Hersholt. Gene Fowler, the writer, specializes in air-mail issues.

Like many of the stars, Wallace Beery flies his own plane. He is the dean of Hollywood pilots, having a transport license and more than 3,000 hours in the air. Johnny Weismuller is working over an outboard speed boat that he expects to race next season.

Sir Guy Standing makes a hobby of naval architecture and has designed several racing hulls. John Barrymore, James Cagney, Lee Tracy, and Warren William, among others, are experienced sailors and have yachts of their own.

ENJOY THE WORLD'S COOLEST SHAVE



Oddly enough, some men still believe they must pay for a quick, close shave with a burning, stinging face. But—*they haven't tried Ingram's!*

Ingram's Shaving Cream makes every shave *cool* and *comfortable.* It wilts whiskers quickly, and at the same time soothes and tones the skin. No need for a lotion—your face feels fine without it.

Next time, lather-up with Ingram's Shaving Cream and get a shave you'll *actually enjoy!*

TRY THE WORLD'S COOLEST SHAVE

Ingram's SHAVING CREAM

TUBE OR JAR

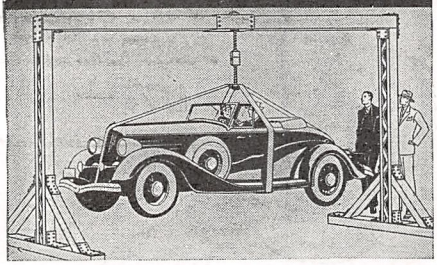
BRISTOL-MYERS CO., Dept. E-2
110 Washington St., New York, N.Y.
You bet I want cool shaves! Send a 10-shave tube of Ingram's, free.

Name_____

Street_____

City_____ State_____

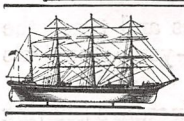
ONE DROP SUPPORTS 2600 LBS.



● Hard to believe—yet it's true! And here's how we made the test. An oak stick was cut in half . . . a drop of LePage's Liquid Glue brushed over the freshly cut ends. . . Then the two parts fitted together again. When the liquid had dried, one end of the stick was fastened to an overhead support—and on the other end was hung an automobile with two men in it. This was carried in a parade in the rain. Was there a crash? No sir! That one drop of LePage's Glue supported the weight of the automobile and the two men—2600 pounds!

Whether you also use nails or screws, always use LePage's Glue—liquid, hard or waterproof—and be assured of immense and lasting strength. You can get it from your hardware dealer.

RUSSIA CEMENT COMPANY
Laboratories and Factory • Gloucester, Mass.



Build the 4-mast Barque, California

Accurate, detailed blue prints of this handsome steel barque. Complete fittings and construction sets for steam trawler and other popular models, including Sovereign of the Seas. Send 15c for illustrated catalog.

NRA

A. J. Fisher, 1002-1 Etowah Ave., Royal Oak, Mich.

DO YOU WANT a new business profession of your own, with all the trade you can attend to? Then **become a foot correctionist,** and in a few weeks earn big income in service fees,—not medical nor chiropody—easy terms for home training, no further capital needed, no goods to buy, no agency. Established 1894. *Address*

Stephenson Laboratory, 1 Back Bay. Boston, Mass.

$5.95 *for Your Old* BATTERY CHARGER

NOW, you can trade in your old, inefficient and costly-to-maintain battery charger—**and cut your battery charging costs 30c to 50c per charge!**

ONLY ---- *The New* Hi-Rate HOMCHARGER

charges a battery overnight . . . and **for a NICKEL.** The FASTEST—MOST EFFICIENT—MOST ECONOMICAL. No expensive bulbs . . . no "dry" units. Only ONE wearing part, replaceable for $1. No radio interference. Trade in your old charger NOW. Write today for special offer and FREE booklet.

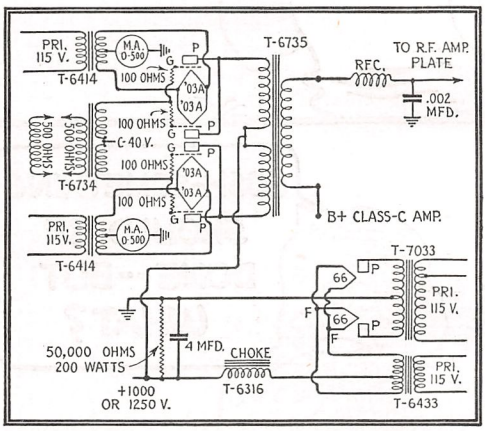
The Automatic Electrical Devices Co., Dept.21, 324 E.3rd St., Cincinnati, O.

CRYSTAL MICROPHONE AND CARBON PLATE TUBES

(Continued from page 424)

of this description are of particular interest to short-wave amateurs operating in narrow bands where frequency control is very important.

The advanced amateur will find that he can get from 50 to 60 watts more out of a pair of 203-A carbon-plate tubes than is possible with ordinary types, as class-B modulators. Actually less audio power is required to drive the four tubes of this type, shown within the circle in the rack,



than would be necessary for two of the large 204-A tubes which would also require more than twice as much plate voltage. The hook-up for this push-pull parallel 203-A class-B modulator, is given in the schematic diagram. The speech amplifier, on the three shelves above, is the general-purpose amplifier which was described in the October, 1934, issue.

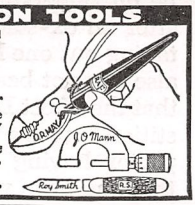
HOW TO CHAT OVER A LIGHT BEAM

(Continued from page 114A)

centrate the light beam on the cell. This separate lens is mounted in a frame placed in front of the cell, as shown in the photo, and adjusted for best position by trial. An enlarged blueprint of all diagrams is available, those who wish it should specify blueprint R-207.

The path of the light beam should be unobstructed and the beam accurately aimed at the receiving station. This system is highly directional and does not interfere with the operation of any radio receiver in the vicinity.

BURN YOUR NAME ON TOOLS
WITH THE
ARKOGRAF



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Write with electricity any name or design on the hardest and finest tools and instruments, or any metal, like writing on paper with pen or pencil.
Complete Outfit $3.50 — Prepaid Anywhere
Interesting illustrated circular free. **Write today.**
Agents wanted.
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NEON SIGNS WHY? HOW?

Big Opportunity in the Neon Sign business! Learn all the hows and whys in this complete practical home-study course. FIVE PARTS—160 large size pages, over 150 illustrations. Covers all branches: Glassblowing—Transformers and Circuits—Vacuum Pumps—Service Work—EVERYTHING! Never before obtainable at any price—now yours at a cost absurdly low. Generous-paying Neon business needs more trained men right away! Learn it in this complete, nontechnical course—**ONLY $4.85,** postpaid to your door! Send Now! Don't lose out by waiting. Mail check, express or postal money order—TODAY!
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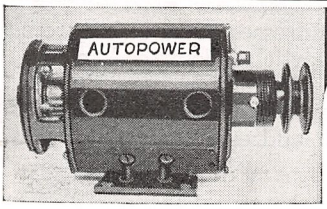
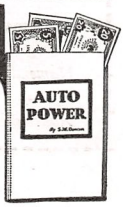


TURN SCRAP INTO MONEY

The new and revised edition of "Auto Power" with all the ten original specifications and ten new ones is now off the press. Convert old generators into A. C. and D. C. generators and motors with voltages of 6 to 400 volts, for power, light, welding, and radio operation. Create new generators adaptable for home, automobiles, or trucks. They can be driven by fan belt, wind, or water. This book, with complete illustrations, tells you how easily and economically these changes can be made. Also instructions for rewinding auto armatures. 350 definitions of electrical terms, etc. Already used and endorsed by thousands. Price, only $1. **AUTO POWER, Dept. B, 410 S. Hoyne Ave., Chicago**



Oilstones

win skating races

HOCKEY PLAYERS and champion speed skaters use India *Oilstones* for taking the burr off newly ground skates. Exhibition rink performers are able to leap, dance and gyrate because they, too, keep their fine steel blades very sharp and true with an *oilstone.*

A famous mechanical engineer once said: "Reputations for skill are made only by workmen who know the fine points about sharpening the tools they use." All fine craftsmen take special pride in fast, easy-cutting hand tools—kept keen with their bench *oilstones.* Drills, reamers and other metal cutting tools need less regrinding and last much longer when *oilstoned.*

A FREE BOOK

"How to Sharpen" is packed with practical facts. It tells why the "India" (electric furnace abrasive), why the rare Arkansas quarried oilstones are used—and how to care for them, too. Thousands of readers of POPULAR MECHANICS sent for this book during the last few months.

NORTON PIKE *Established 1823*

Use what Experts use — *Products*

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Dept. E, Troy, N. Y.

Send me free, Norton Pike Book, "How to Sharpen."

Name.....

Address.....

SECRETS OF THE LOST MINES

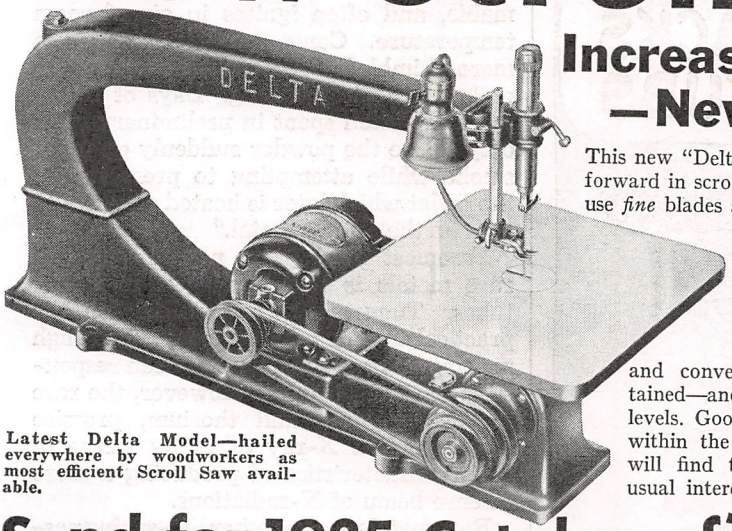
(Continued from page 395)

somewhere in the Colorado desert of California. One legend has it that "Pegleg" Smith, a one-legged prospector, found an outcropping of dark crumbling quartz on the top of three small buttes within sight of a tall mountain that has a spring of clear water at its base. That was undoubtedly a story told by Smith to keep others away, for no such buttes have been found. Smith made trip after trip to his mine, always shaking off pursuit, and always returning to San Bernardino with a load of virtually pure gold. Finally he disappeared and later his body was found stretched out in the sand, one hand clutching a sack that contained fifty pounds of rich ore. The finder emptied the sack of half its load and carried it with him, but when he reached San Bernardino he was so exhausted that he died before he was able to tell just where he had found Smith's body. The "Lost Pegleg" has been the goal of hundreds of prospectors.

Another lost mine that seems to have vanished into thin air is the "Superstition" somewhere on Superstition mountain near Phoenix. This was a large body of rich ore worked by a party under the command of Don Jose Peralta more than 100 years ago. After the miners had taken out a fortune they were massacred by Indians. Two boys were the only survivors and later they were found by a prospector wandering in the hills. The story goes that the boys took the prospector back to the mine and that he killed them in order that no one except himself should know its location. The new owner worked the mine for years and eventually died on a visit to a frontier town without telling its location. The "Lost Dutchman," also supposed to be on Superstition mountain, was named after an ex-soldier who disappeared after taking out one load of gold ore. This mine also has not been found and many believe that the "Lost Dutchman" and the "Superstition" are the same mine, the later prospector having discovered the same vein that had been worked by Peralta.

¶Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

New Scroll Saw

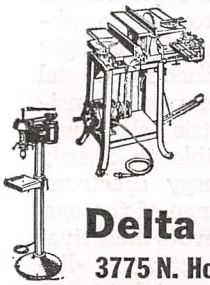


Latest Delta Model—hailed everywhere by woodworkers as most efficient Scroll Saw available.

Increased Efficiency —New Features

This new "Delta" Scroll Saw is another great step forward in scroll saw performance. Enables you to use *fine* blades at *full motor speed* without danger of breakage. Has many other novel and useful improvements. This year the Delta line of motor-driven woodworking tools is more complete than ever before. Delta standards of efficiency, quality, and convenience have been strictly maintained—and Delta prices still kept at their low levels. Good compact motor-driven tools are within the reach of all. Every woodworker will find the new 1935 Delta line of unusual interest.

Send for 1935 Catalog of "Delta" Tools



The 1935 catalog of Delta quality motor-driven tools is now off the press. It is crowded with photographs and information about the new line of 1935 Delta tools. It shows how Delta tools are built to stand the grind of production work, and yet are so low priced as to be within the reach of all. Send coupon so your name will be placed on the mailing list to receive the 1935 Delta catalog without delay. Enclose only 10c at same time for Book of Practical Delta Projects, 32 pages of new and novel things to make with many blue prints, working drawings, photographs and illustrations—and complete directions.

Delta Manufacturing Co.
3775 N. Holton St., Dept. A335, Milwaukee, Wis

DELTA MANUFACTURING COMPANY
3775 N. Holton St., Milwaukee, Wis. Dept. A335

I enclose 10c (stamps or coin), for which please send me one copy of "Practical Delta Projects." Also place me on your mailing list to receive 1935 Delta catalog of quality motor-driven woodworking tools.

Name.....Age?.....

Address.....

City.....State.....

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The Modern Mach

THE 20TH CENTURY INVENTION THAT REVOLUTIONIZED THE MACH. INDUSTRY. A REAL WATER, CHILD AND RAT PROOF SAFETY MACH MADE OF METAL. LIGHTS 1000 TIMES OR MORE.

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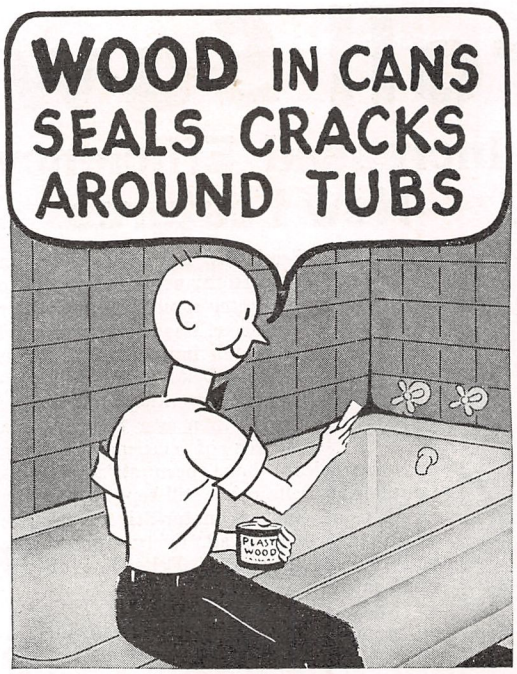
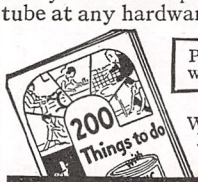


Permanent—Waterproof

For sealing around pipes — permanently replacing loose tiles—repairing damaged toilet seats—loose towel racks, glass holders—1001 other household uses.

Plastic Wood is the scientific marvel of the age—wood in putty form that dries to hard, permanent, waterproof wood.

It adheres to any clean, dry surface—wood, metal, glass, stone, porcelain—can be painted, varnished or lacquered—can be worked with any wood-working tools; can be planed, sawed, sanded, turned on a lathe—will hold screws and nails firmly—will not split or crumble. Get your can or tube at any hardware, paint or department store.



Plastic Wood also comes in white which is ideal for bathroom repairs.

FREE
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PLASTIC WOOD

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LUCKY TIGER
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Does the work and does it now. Get a jar today and prove it in Athlete's foot, Fire and Sun Burns, Itch, Cold Sores, Skin Irritations, Rash, etc. Generous sample Free upon request.

Lucky Tiger Mfg. Co., Kansas City, Mo.

METALS MORE COSTLY THAN JEWELS

(Continued from page 415)

mable, and often ignites in air of room temperature. Consequently, to obtain a mere thimbleful of uranium requires no end of delicate handling. Days of trying work are often spent in preliminary steps only to see the powder suddenly go up in smoke while attempting to press it into the pellet which later is heated electrically to form the ductile metal."

Foremost among the possible uses of rare metals is that of targets in X-ray tubes. Tungsten is responsible for the practical X-ray tube of today. The high melting point of tungsten has been responsible for this progress. However, the rare metals, uranium and thorium, promise more efficient X-ray tubes by virtue of their characteristics of producing a more intense beam of X-radiations.

Rare metals possess other life-saving possibilities in the field of ultra-violet radiation. They have an inherent characteristic of setting up a flow of electrons when subjected to radiant energy, both visible light and invisible ultra-violet. Each rare metal has its own peculiar "finger-print" sensitivity. Thus, in photo-electric cells, these rare metals make it possible to classify certain bands of the energy spectrum, "seeing" far beyond the range of the eye.

Research metallurgists devote their lives to their microscopes, attempting to discover the widest use of rare metals to promote longer life. These rare metals then, are extending the life expectancy, and helping man to weather adverse storms.

EYES OF THE AIR

(Continued from page 411)

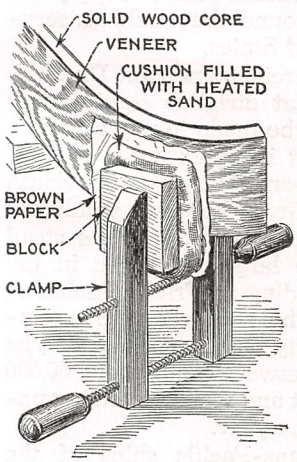
graph to put all the contours in a map of that mountain without actually surveying the mountain from land. In this manner Mr. Shippee secured scientific data of the Valley of Volcanoes in Peru in less than a month which he estimates it would take ten years for a land party enduring tremendous hardships to obtain.

During the past decade, science has developed the aerial camera to a high degree of efficiency. It had to reckon with a human factor whose visibility at 10,000 feet altitude was about 130 miles to the horizon

(Continued to page 129A)

Regluing Veneer on Curved Surfaces

A problem often met with by the home mechanic is that of refastening veneer which has been loosened as a result of water-soaking or drying of the glue. This occurs frequently on chair joints and seats, on curved dresser fronts and a variety of places where rare veneers are used. In factories, cauls or specially shaped forms are used, but these would take considerable time to make at home. The following method has been used with success: First loosen the veneer with a knife and scrape away the dust and old glue between the veneer and the solid wood or core. Then apply glue to both surfaces. Have ready some fine, clean sand that has been heated in a pan. Fold a quantity of the sand inside of a piece of heavy cloth or canvas to form a cushion. Put the cushion over the loose veneer with a piece of brown paper between them. Lay a block of wood over the cushion and clamp together, as indicated in the drawing. Under the pressure of the clamp the veneer will be held against the wood at all points. Allow the glue to dry for 24 hours and then remove the cushion. Usually the paper sticks to the wood, but this can be removed with a cloth moistened in water.

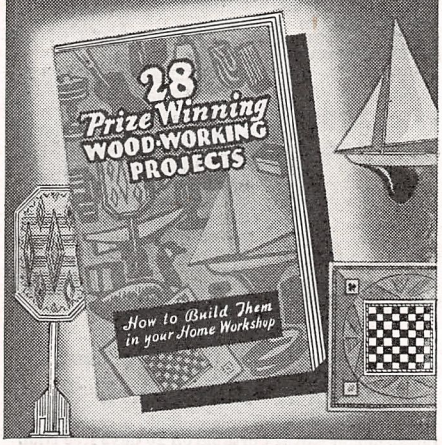


Glue Spreader Made from Linoleum

Liquid glue can be spread evenly over a smooth surface with a tool, which is made by cutting shallow notches at ½-in. intervals along one edge of a piece of linoleum or stiff cardboard 6 or 8 in long. It is advisable to make the tool about 5 in. wide, so that the fingers will not come in contact with the glue.

¶An inexpensive ladies' earring from a dime store makes a good clamp for holding tiny model parts while gluing them.

FREE



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From Coast to Coast, the cream of home workshop production. Packed between the covers of a book, the pick of the skill and ingenuity of people interested in wood working.

Yours to study ... learn from ... and duplicate. Yours, FREE ... when you send in the coupon below.

The projects illustrated and explained in this new CASCO book, range from vases to portable camp refrigerators, and from wooden jewelry to smoking sets. Each one was actually made, not merely an idea. Every one is useful or decorative, and is put together to give a lifetime of service.

We think that giving away this book is a good way to introduce CASCO Glue. We know that once you see these articles ... and realize how much of their permanence depends upon sticking together ... you'll use this famous waterproof, heatproof, super-strength industrial glue, that is now available for home crafters.

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AIR TICKETS AROUND THE WORLD PLEASE!

(Continued from page 359)

northern cape of Hokeido, the main island of Japan. We had the airship safely under control in this turbulent atmosphere. She rode so smoothly that the passengers slept undisturbed, without even realizing what was going on."

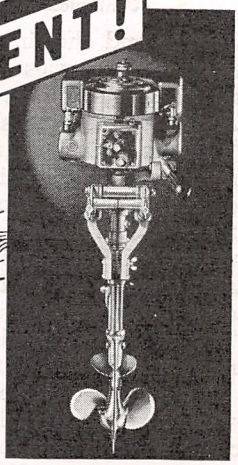
Pan-American also has had opportunity to acquaint itself with weather conditions on the Atlantic side. For the past four years the company has maintained a regular air transport service across the Caribbean from North to South America. The weather experience and knowledge gained here is expected to be of service on the trans-Pacific route. The Post Office department is greatly interested in both the Pan-American and Eckener plan to supply the missing links of round-the-world air service for the United States.

From a commercial standpoint Dr. Eckener believes that dirigible service over the Atlantic can be made to pay although there is a deficit in operating the "Graf Zeppelin" between Germany and South America. The "Graf," however, would not come to the United States. In its stead would come the largest dirigible in the world, now building at Friedrichshafen, the "LX-129." This ship will have accommodations for fifty passengers and will be able to carry between 45,000 and 60,000 pounds of freight and mail, depending upon the time of the year.

The great trans-Pacific ships of the Pan-American are to be found duplicated in the "Brazilian Clipper," now plying the air above the Caribbean. Empty, the "Clipper" weighs 19,000 pounds. She has a carrying capacity equal to her weight. Her cruising speed is 160 miles per hour, her top speed 190 miles. She has a landing speed of sixty-five miles per hour, her range is 1,200 miles without refueling, her gasoline capacity is three and three-fourths tons. Her wing spread is 114 feet, two inches, her length sixty-eight feet, and she is capable of carrying thirty-five passengers, 2,000 pounds of baggage, mail and express.

Under the new trans-Atlantic service it will be possible for a California to London trip to be made in approximately two days time. Around-the-world service would possibly occupy another eleven days.

DIFFERENT!



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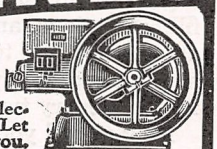

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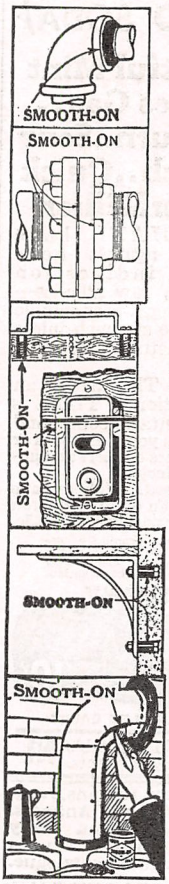
YOU NEED THIS FREE HOME REPAIR BOOKLET

Contains diagrams and simple instructions for emergency and routine repairs that every home and auto owner can *and should* make himself. Revised edition, greatly enlarged and completely rewritten. Get a copy for your workshop.



Be thrifty—do your own work—and keep the money otherwise paid to plumbers, repair men and for new parts.

With Smooth-On No. 1, you can stop leaks at joints, seams and cracks in pipes, boilers, heating systems, tanks, pails, auto radiators, water jackets and crank cases, tighten loose parts, reset stripped screws, bolts and nuts, and make dozens of other equally practical repairs—all at almost no cost, and in emergencies without the delay of waiting for outside help.

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TUMS free you from this danger. They act as an acid "buffer." The scientific explanation of TUMS is that it acts *gently*—just enough of the antacid compound is released to counteract *over*-acidity. When your heartburn or sour stomach is corrected—the balance passes on inert and undissolved, without affecting the blood or kidneys.

Try TUMS. Munch 3 or 4 when distressed. Millions have turned to this gentle, *effective* treatment—it's quite likely you will, too. 10c at all druggists. 3-roll carrier package, only 25c.

Free 1935 Calendar-Thermometer, beautifully designed in colors and gold. Also samples TUMS and NR. *Send stamp for postage and packing to* A. H. LEWIS CO., Dept. 21-CMM, St. Louis, Mo.

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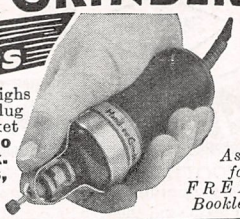

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New **MASTER CRAFTSMAN'S SET** 17 useful accessories to grind, drill, polish, sand, cut, carve, engrave, etc. Prepaid $5.00

CHICAGO WHEEL & MFG. COMPANY
108 S. Aberdeen St. Chicago, Ill.

WHO PAYS THE TAX

(Continued from page 379)

on candy and chewing gum, and ten per cent on such luxuries as electric refrigerators, fur coats, cameras and sporting goods.

A disproportionate slice of the taxpayer's bill is levied against his automobile. The motorist has seemingly been taxed on the theory that a person that can afford a car can afford almost anything; but with four out of five families in the United States owning autos, the "soak the rich" theory no longer holds water.

The average motorist pays an annual direct tax of $47.77. The biggest item here is on gasoline, which ranges from two to seven cents in the various states, in addition to the one cent federal tax. The average motorist uses 600 gallons of gasoline a year, on which he pays $21.75, and this does not include the local taxes collected by some counties and cities. State registration fees average $12.67, in addition to the local registration required in some cities. Federal excise taxes average $10.40, and personal property and municipal taxes come to $2.95. Income and property taxes of the manufacturer and dealer have not been included, although the owner pays these when he buys his car. Taxes on garages, repair shops, refiners, pipe lines, filling stations, and accessory dealers are all passed along to the consumer, until the average motorist pays the value of his car in taxes every two years.

How would you smokers like to be able to buy a package of your popular brand of cigarettes for only seven cents? That is actually what you are paying for the cigarettes now, for the other six cents is the federal internal revenue tax which the blue stamp signifies has been paid, but which has been passed on to you and included in the price. The smoker who uses a package of cigarettes a day pays $21.90 a year for those blue stamps.

During the fall of 1934 the federal government alone spent an average of $17,000,000 a day. The biggest item is the administration of relief for the needy. Nearly 20,000,000 persons have been helped by funds obtained from the government. In addition there are government pay rolls—federal, state and local. With one person out of three being supported by taxation, it is no wonder that a quarter of the family income must go to the government.

EYES OF THE AIR

(Continued from page 124A)

compared to six or seven on the ground and whose eyesight encompassed from eighty to 100 square miles on the ground in contrast to about 50,000 square miles at 10,000 feet. It had to contend with intense cold at high altitude, cold which required heating not only the camera but the film itself to prevent it from becoming brittle. It was faced with the necessity of making spools of film which would take over 100 pictures at a single loading, film which in some cases was seventy-five feet in length, requiring special developing on reels made for that purpose.

When an airplane flies over land which has no distinguishing landmarks from which bearings may be taken, it is necessary to take compass bearings which, when used as a guide for aerial surveying, require extreme accuracy. The aerial surveyor is, as a result, placed on his mettle in surveying such territory as swampland, sand deserts and shorelines.

When Lieut. Col. Blacker flew over Mount Everest he placed a small red electric light bulb on the pilot's instrument panel and with each picture he warned his pilot to steady the plane by flashing the light. The late Lieut. G. R. Johnson, chief photographer for Aerial Explorations, developed new and efficient types of camera mounts as well as a process of checking aerial surveys which enabled maps to be completed with unusual speed.

"There is no telling to what new use the photographic products of the eyes of the air may be put," says Mr. Shippee. "One of the most unusual was recently demonstrated by C. W. Collier of the federal soil erosion department. He had endeavored to get a group of farmers to terrace their lands to prevent erosion. They couldn't see much in the idea. Mr. Collier showed them an aerial oblique photograph showing how the Incas had terraced their farm land hundreds of years ago. The photograph convinced them that terracing wasn't so 'new fangled' after all.

"The traffic branch of Scotland Yard used an autogyro to determine why there was a terrific jam in Westminster. They found the answer at a point far away where there was a bottleneck. In the same way the eyes of the air might be employed in solving traffic problems here."

NEW!

BAUER & BLACK

Wet-Pruf

ADHESIVE TAPE

● Snow white and 100% waterproof. No matter how often Wet-Pruf gets wet, it won't curl up or ravel around the edges. Wet-Pruf has a smooth, kid-like finish—resists soiling—washes clean. Costs no more than regular adhesive tape. All regular sizes, 5¢ to 70¢.

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Astonish Your Friends

MAKE A beautiful WOOD INLAY CHECKERBOARD

WE SEND ALL MATERIAL: "light squares" of finest mottled Aspen; "dark squares" of famous Australian Oriental Wood; cut precisely to 2" squares; 17½x17½" substantial wood base; includes a border of African Koko Wood and a finishing beading. Clear instructions enclosed. Great fun. Easy to make. Money-maker, too, if desired. (You know how much inlaid boards cost in stores!) ONLY $1.25 postpaid. Send check, money-order, or cash. Money back guarantee.

WOOD VENEER

Special Offer: assortment of 12 different exquisitely colored wood veneers from 6 countries; standard for beautiful inlay work of all kinds. Only $1.10 postpaid. Money back if not entirely satisfied.

M. D. WILLIAMSON CO. Beaver Dam, Cockeysville, Md.

MIRACLES IN TELEVISION

(Continued from page 324)

in proportion to the intensity of light reaching them. As the electrons are freed, a cathode-ray beam scans the plate or droplets and reproduces the picture created by differences in light intensities.

Farnsworth transforms a picture appearing on a flat, metal photo-sensitive plate into a picture in electrons, which are focused from their diverging paths by magnetism into a picture at the other end of the tube. Then through an ingenious multiplier, the scientist increases the number of electrons a thousand times until the projected picture is many times brighter than is possible with the original beam.

Three years ago, William Priess, a veteran radio engineer of New York, began the development of a novel method of mechanical scanning which recently has been so simplified it offers the key to the solution of television. Priess employs a polished steel mirror one-fourth-inch square and plated with rhodium alloy, a metal having high reflecting value. He mounts the mirror midway on a six-inch length of piano steel wire and welds each end of the wire into an iron yoke supported by two small metal rods, the outer ends of which are welded to blocks of iron. Back of the mirror is a steel fin located in the air gap of an electro-magnet, through whose coil is passed alternating current of 5,000 cycles.

The current causes the mirror to swing right and left about the axis of the steel wire through a total angle of seven and one-half degrees, which throws the reflected beam of light through an angle of fifteen degrees. Meanwhile, the yoke supporting the wire and mirror is caused to oscillate at right angles to the swing of the mirror. The mirror as it vibrates reflects the beam right and left. In order to obtain a square, magnets move the mirror up and down twenty-four times a second. This square beam, then, scans an object 5,000 times a second right and left and twenty-four times up and down.

Fortunately, no fabulous sum is needed to give the world efficient television. From the hands and minds of these experimenters, television is almost ready. Miracle will pile upon miracle from a simple beginning until we have brought into our homes sight and sound of great educational and entertainment values.

What Other Leaders Say

"It should be appreciated that technical solutions are but one phase of a national television system, which, in order to exist, must provide lasting entertainment and not deteriorate into a novelty of passing interest," says W. R. G. Baker, vice president of the R. C. A.

Here are some of the problems which Mr. Baker has in mind:

First, there must be general agreement among manufacturers and broadcasters as to the system of television which should be employed, in order to make it possible for any home receiver to intercept the full broadcast range of signals.

Second, believing that television will ultimately finance itself, there is yet no visible means of making it pay during the early days.

Next, the industry is considering the supply of televizable material. If it falls back on movie films, it encounters a knotty copyright situation. Besides, the present movie production is inadequate for the needs of television since the whole movie industry produces only 300 feature films per year, an equivalent of 350 hours of entertainment.

John V. L. Hogan, who invented single dial tuning on broadcast receivers, holds the opinion that television is no longer around the corner—it's here.

"The reason no television broadcast programs are available is that the three essential elements of such a service are lacking. They are: first, an adequate television transmitter; second, a source of interesting program material, and third, a supply of television receivers that can be distributed at a reasonable price and which will give good reproduction. Another essential is that picture programs shall be accompanied by synchronized sound.

"It is quite probable that before very long some forward-looking broadcasters and manufacturers will combine their facilities in such a way as to provide a useful and interesting television service."

David Sarnoff, chief of the RCA-Victor forces, said:

"If we use our imagination, we also may dream of television in faithful colors. I believe that dream will come true one day, and when it does, every home equipped for reception can at certain times become an art gallery."

Now even the roof is steel!

new solid steel

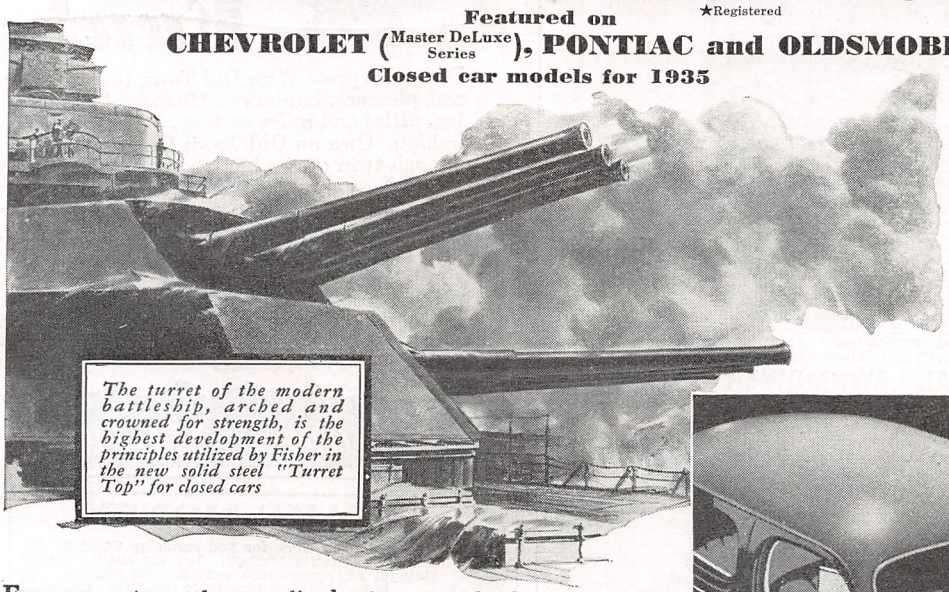
FISHER "TURRET TOP"★

★Registered

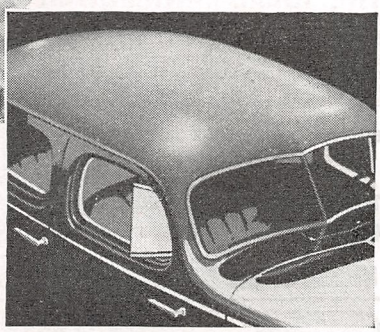
Featured on

CHEVROLET (Master DeLuxe Series), PONTIAC and OLDSMOBILE

Closed car models for 1935



The turret of the modern battleship, arched and crowned for strength, is the highest development of the principles utilized by Fisher in the new solid steel "Turret Top" for closed cars



This is the way the new Fisher "Turret Top" looks — a single seamless sheet of tough drawn steel, steel reinforced with steel like a battleship turret

FISHER engineers have realized for years that a *roof of steel* was the desirable thing for the modern closed car. Yet no one had ever successfully created such a roof. It involved new methods, new principles, the designing of vast new presses.

Huge sheets of tough, seamless steel had to be drawn and fashioned into these beautiful, protective roofs.

Now, success has crowned Fisher efforts. The safety steel roof *has been perfected* and named the "Turret Top" from its resemblance to the armored battleship turret.

This roof is all steel—even to the bows—and is unit-welded to the steel body panels. It is also singularly smart and graceful—and scientifically insulated against heat, cold, drum, rumble, rattle or noise of any kind—even at high speed.

We regard it as the greatest advance in motor car safety in a decade—and one of the greatest advances in smartness also.

Of course there are other worthwhile advantages in Body by Fisher for 1935 — Fisher No Draft Ventilation is as important as ever — and you will find full streamlining, more luggage room, windstream V-type windshield, wider seats, more headroom, bigger doors as well.

But the most vital advance of all is the new solid steel "Turret Top" —introduced on the new Chevrolets (Master De Luxe Series), Pontiacs and Oldsmobiles—and found, *like Body by Fisher,* ONLY *on General Motors cars.*

BODY by FISHER

CHEVROLET

PONTIAC

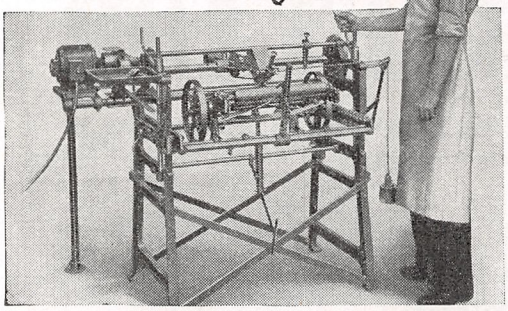
Oldsmobile

BODY BY FISHER on GENERAL MOTORS CARS ONLY:

CHEVROLET • PONTIAC • OLDSMOBILE • BUICK • LA SALLE • CADILLAC

COMPLETE PLANS

FOR A PERMANENT PROFITABLE BUSINESS OF YOUR OWN *free*



MAKE $30 TO $40 A WEEK

Our free plans show you how to build a successful business of your own sharpening lawnmowers. Positively no experience necessary. Most men average from $30 to $40 a week. J. B. Van Dien, Ridgewood, N. J., writes: "Some weeks I earned $40 a week with my Ideal just as a side line." H. Greenlau, Fond du Lac, Wis., writes: "In May I sharpened over 200 mowers at $1.00 each." Niles C. Race, Rochester, N. Y., writes: "I have sharpened 785 mowers at $1 each."

THE IDEAL LAWNMOWER SHARPENER

Makes old, dull lawn mowers cut like new. Mowers run easier, stay sharp longer—customers come back year after year. Start right at home. Attach the Ideal to your lamp socket. Sharpens any make of mower in 15 to 20 minutes—you get $1.00 to $1.50. Attachments for grinding skates, grass shears, hedge shears, sickles, scythes, axes, etc.

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For Machinists and Toolmakers
Preferred by Particular Men
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Give **GLOVER'S EXPECTORANT MIXTURE** to your pet to relieve coughing. **GLOVER'S FEVER REDUCER and STIMULANT Medicine** should be administered in the early stages of colds, bronchitis, pneumonia or other diseases accompanied by high fevers. Protects the animal from more serious complications. Lowers the high fever in distemper.

GLOVER'S NEW FREE DOG BOOK is an invaluable aid in the Care, Training and Feeding of your dog. Explains symptoms, causes and treatment in detail. Write for it today to **GLOVER'S, Dept. Y, 462-468 Fourth Avenue, New York City.**

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When writing please mention Popular Mechanics

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Fun!

POINT the prow of an Old Town toward real pleasure. Exploring. Hunting. Fishing. Miles and miles of fun . . . Indian-fashion. Own an Old Town Canoe. It's a tough twin of the birch-barks. Quick. Light. Easy to paddle or portage.

Get a free illustrated catalog. See all the different models and prices (starting at $68). Sponsons, sailing canoes, square-stern types. Also a fleet of outboard boats, including big, fast, seaworthy craft for family use. Rowboats and dinghies. Write to Old Town Canoe Co., 133 Main Street, Old Town, Maine.

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There's lots of work for you surfacing floors by the American Electric Method. Let the coming Spring rush get you started into something for yourself. No large capital or experience required. Complete information free—without obligation—write today.

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Save! Build your own from auto parts using our plans and special parts. Band saw; circular saw; drill press; shaper; lathe. Send dime for illustrated catalog containing details, several free plans, and treatise on wood finishing. A big dime's worth! (Refunded on first order.)

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GUARANTEED ONE YEAR

1935 MODELS

Benjamin Super Single Shot Air Rifles—Bolt Action—Hammer Fire —Hair Trigger—shoot lead or steel BB shot and 177 or 22 pells and darts. Illustrated and described in **New "BB Magic" Free—Write Today**—get full details of **Benjamin 25 Shot Repeater** and **New Benjamin Air Pistol —Free Targets—SPECIAL INTRODUCTORY and TRADE-IN OFFERS.**

FREE
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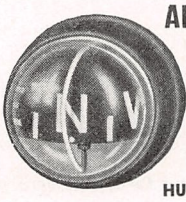
THE SHOOTER'S DIGEST

BENJAMIN AIR RIFLE CO. 697 N. Broadway St. Louis, Mo., U. S. A.

AMAZING AUTO COMPASS



Don't lose time and money by taking the wrong road and going many miles out of your way. This new AIRPLANE TYPE COMPASS constantly tells your direction of travel. Sticks to windshield. Base 1⅞" diameter. ONLY $1.95 POSTPAID, including Compensator. SATISFACTION GUARANTEED or your money refunded if returned within ten days.

DEALERS WANTED!
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WHY DO NEW CARS NEED "LIGHT" OIL ?

Car makers, in their constant efforts to step up the *efficiency* of your motor, have been fitting the wearing surfaces *closer and closer together.*

This helps to seal the motor against power loss. But it presents a serious problem in lubrication. Your oil now has only a fraction as much space in which to flow between the wearing surfaces, a space too narrow for any but a "light" oil.

Obviously, the "lighter" the oil, the *better it has to be.* Not only because there is a *thinner film* of it on the working parts (though that is reason enough!) but because with the new high-speed motors, your oil is subjected to *greater heat and tension* than ever before. Therefore, if you would avoid motor damage, buy only the best!

You will probably find that your motor consumes a little more oil with the "light" grades. But the slight extra cost here is easily offset by the extra mileage from your gasoline . . . an economy made possible by the new closer-fitted motors.

There is no reason to worry about whether your motor will be "broken-in" safely with "light" oils . . . *if you buy the best.* That's why you'll find more new car owners using Quaker State this year than ever before. Quaker State Oil Refining Company, Oil City, Pennsylvania.

•

"First choice of Experience"

QUAKER STATE MOTOR OILS

THE MASTER OF MOVIE THRILLS

(Continued from page 351)

formed an arc across the flooring to a pipe underneath, completing the circuit up through Strickfaden's body along the wire on his arm to the safety horn gap which broke the circuit and prevented possible electrocution. Repairs were soon made, the cable moved and a subsequent take was made without further trouble. Strick-faden said the only sensation he felt was

The Home Craftsman's
MOST USEFUL TOOL

One home expert says: "I can do 60% of many jobs with Nicholson Files." Another says: "Forty", some go as high as 70%.

There is little doubt that the world's most popular file—Nicholson—is the home craftsman's most useful tool.

Here are ten of the most popular Nicholson Files selected by a vote of expert home craftsmen: Metal working—Round, Flat, Mill, Half Round, Three Square; for Wood Working—Cabinet Rasp, Half Round Wood Rasp, Last Makers Cabinet Rasp, Flat Wood Rasp.

Hardware stores everywhere carry Nicholson Files—priced to meet popular demand. Nicholson File Company, Providence, Rhode Island, U. S. A.

Genuine

NICHOLSON FILES

A FILE FOR EVERY PURPOSE

Catch Fish!

Eels, Mink, Muskrats with our new folding galvanized **STEEL WIRE TRAP.** Write for our **FREE TRAP OFFER** and Bargain Catalog. **$1 Box** of our famous Fish Bait FREE to introduce our traps. **WALTON SUPPLY CO., 3509 JUNIATA AVE., ST. LOUIS, MO.**

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Put tobacco and block of papers on machine, TURN THE CRANK—PRESTO—CIGARETTES. Easy—simple. All metal construction. Guaranteed. No cloth ribbons; no special tube or gummed papers required. **ASK FOR FREE ILLUSTRATED FOLDER.** AUTOMATIC CIGARETTE MACHINE WKS., PM-3, 1055-57 Sheridan Rd., Chicago, Ill.

MATCHES ALWAYS DRY!

—if you carry a Marble's water-proof match box in your pocket. Absolutely water-proof—holds supply for several days. Made of seamless brass, size of 10-gauge shell. Only 60c at your dealer's, or sent postpaid. Get one today. Write for complete FREE Catalog.

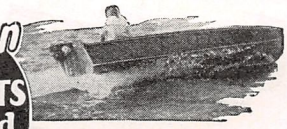
[A5]

Marble Arms & Mfg. Company
578 Delta Av. Gladstone, Mich. U.S.A.

NEW CAR FEATURES

(Continued from page 133A)

"sixes," while Packard enters a lower price class with the "120," a 110-horsepower, eight-cylinder car on 120-inch wheelbase. In contrast to Graham's new sixty-horsepower "six," Auburn introduces a supercharged eight with a certified speed of 100 miles per hour and Duesenberg has a supercharged roadster guaranteed to do 165.



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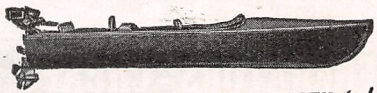
Most complete line ever offered, at real money-saving prices.



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SNIPE SAIL BOAT

Crosby-Rudder design. Eligible for racing in its class. A very fast and able craft that will outsail many boats having double its sail area. Safe and dry under actual sailing conditions. Length, 15½ ft.; width, 5 ft.; depth, 20 in. Weight, 450 lbs. *Price, $185.*

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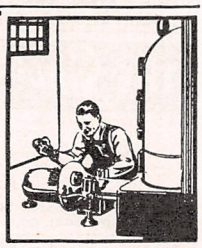
INSTALL YOUR OWN BURNER



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Let me send you this fine all-wool tailored suit **FREE OF COST.** Just follow my easy plan and show the suit to your friends. Make up to $12 in a day easily. **No experience—no canvassing necessary.**

Send for Samples—FREE OF COST

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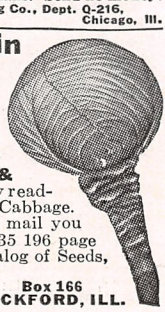

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Shop Equipment Since 1911

1935 Model Atlas "Unit-Plan" METAL-WORKING LATHE

. . . designed so units may be added

$39.50

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Here's a lathe that meets every need economically. As your shop grows, you can add to it UNIT by UNIT until you have a fully equipped, back-geared, screw-cutting lathe, capable of every kind of lathe work—as fine a tool as a man could wish for. This first step has a precision-ground bed of heavy ribbed cast iron; hollow headstock spindle; tailstock; compound rest; driving belts and pulleys, etc. Takes 24 in. work between centers and has 10 in. swing.

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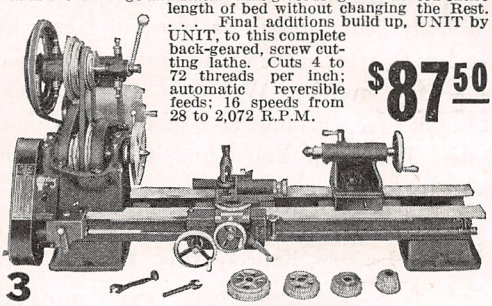
By adding countershaft assembly you get greatly increased power and wider speed selection. ($49.25) Ideal for all small metal jobs and work on radio, armatures, valves, pistons, etc. The next step ($54.75) substitutes different Compound Rest and adds the Carriage and Rack. This gives longitudinal feed entire length of bed without changing the Rest. . . . Final additions build up, UNIT by UNIT, to this complete back-geared, screw cutting lathe. Cuts 4 to 72 threads per inch; automatic reversible feeds; 16 speeds from 28 to 2,072 R.P.M.



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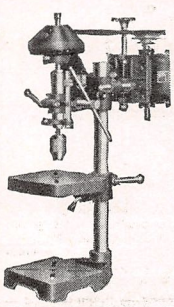

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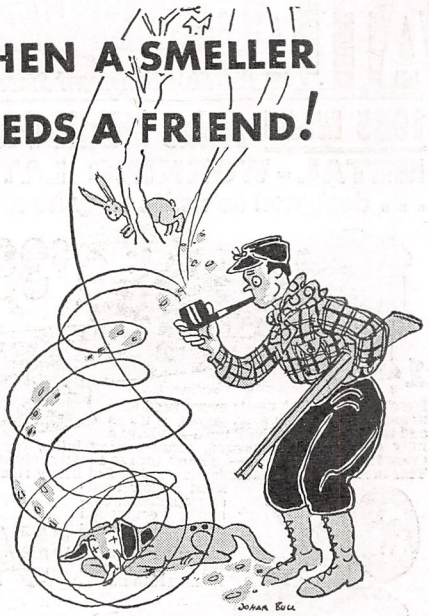
WHEN A SMELLER NEEDS A FRIEND!



THE hound's nose was keen and alert. The hunter's pipe was strong and neglected. So the rabbit trotted safely back to his home and missus.

A few pipe cleaners and a tin of mild, fragrant tobacco like Sir Walter Raleigh would have put a happier ending to the hunt. Sir Walter's an extremely gentle tobacco, a blend of Kentucky Burleys fragrant as the woods in spring and mild as a May morning. Well-aged, slow-burning, it has become a national favorite in mighty short order. Try a tin. You'll find it kept fresh in heavy gold foil.

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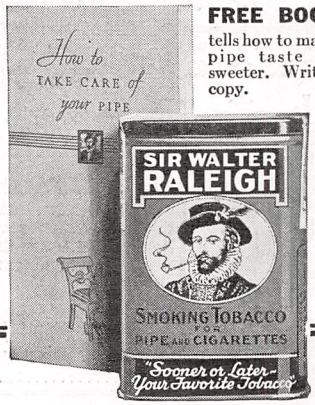
Louisville, Kentucky. Dept. P-53



FREE BOOKLET tells how to make your pipe taste better, sweeter. Write for a copy.

It's 15¢ —AND IT'S MILDER

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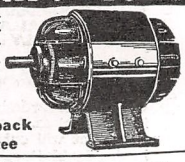

Make your own light plant or battery charging outfit, using engine, windmill, water wheel or other power. These new generators (made by Robbins & Myers) are 1000 watts, 32 volts, D.C., Ball Bearing, built-in motoring coils to self start a gas engine. Wt. 100 lbs. Regular price $90.00. While they last, $25.00 cash or $10.00 down, $3.00 per month for 6 months.

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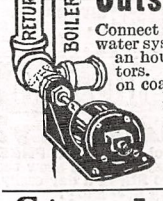

Connect an Aquapush to the return pipe on your hot water system. Speed up circulation. Warm your house an hour quicker. Force hot water into "cold" radiators. Save fuel. Aquapush is easy to install. Works on coal, gas or oil — and with any boiler. Low cost. Durable. Simple. Cheap to operate. Soon pays for itself.

Write for Details Illus. circular gives ten reasons why Aquapush will give you satisfaction.

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Plow Seed Cultivate Mow Haul and Lawns

Powerful Tractors for Small Farms, Gardeners, Florists, Nurseries, Fruit and Poultry Men.
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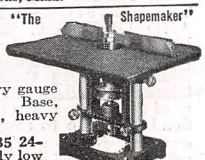
WOOD SHAPER $3 post paid Less cutters (C.O.D. on cutside U. S. $3.25)

"The Shapemaker"



Uses standard 5/16" cutters. Table is heavy gauge pressed steel, 8"x5¾"; stands 5⅜" high. Base, table support and spindle adjusting slide, heavy gray iron castings. Oilless bearings.

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The New Hi-Rate 10 to 6 Ampere AUTOMATIC HOMCHARGER Does it

Compare THESE FEATURES

1. Fast—10 Amperes Will charge fully overnight
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PLUGS in lamp socket. Charges any auto-type battery **overnight** and for a NICKEL. Creates no radio interference. Uses no expensive bulbs, "dry" units, or messy liquids. Has only ONE wearing part, replaceable for $1, after thousands of hours use.

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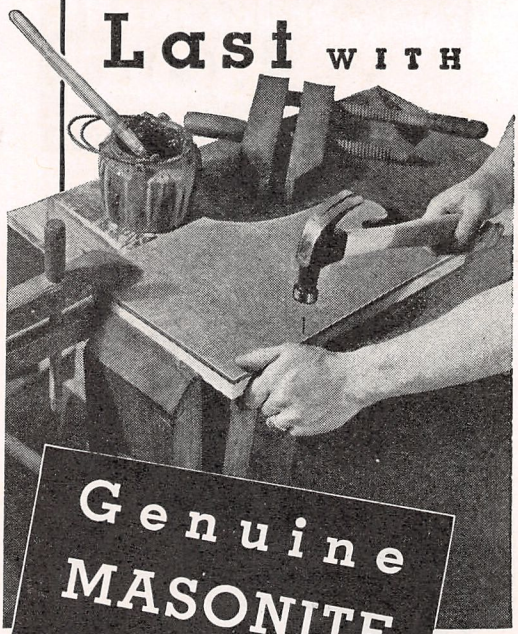

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Beats any oil burner ever gotten out for low cost, perfect performance. Slips into any old stove, range or furnace; burns cheap oil a new way, without generating or clogging up. Intense heat instantly BY SIMPLE TURN OF VALVE.

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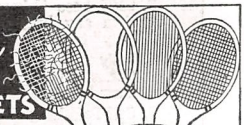

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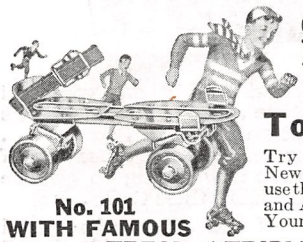

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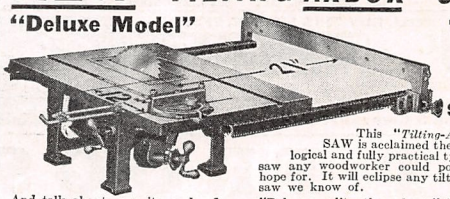

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And talk about capacity and refinements! This Boice-Crane has a huge 20x27 inch table. With 10 inch dia. blade, cuts 3 inches thick. Cuts-off 12 inches, and rips as wide as 21 inches.

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Also Shapers
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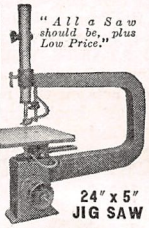

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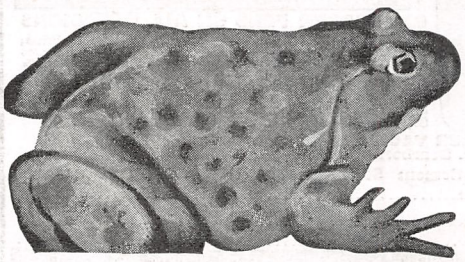

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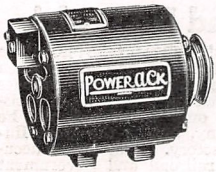

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425-POWER $18.50

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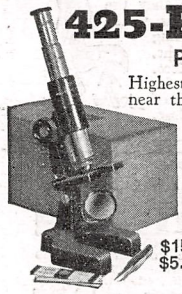

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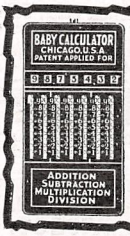

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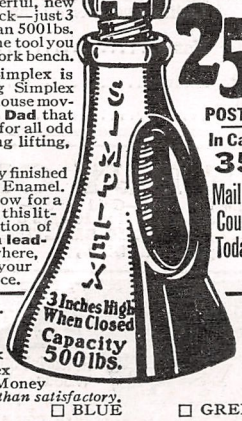

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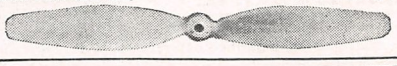

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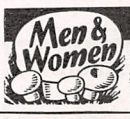

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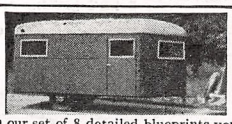

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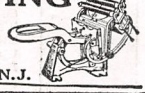

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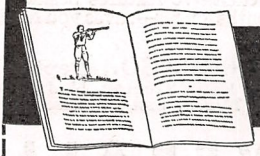

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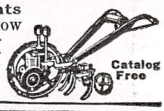

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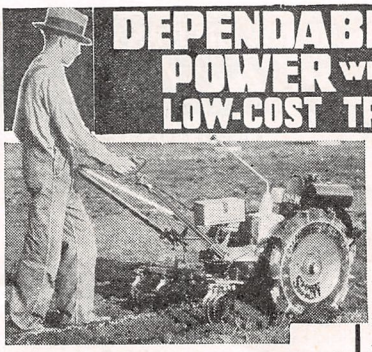

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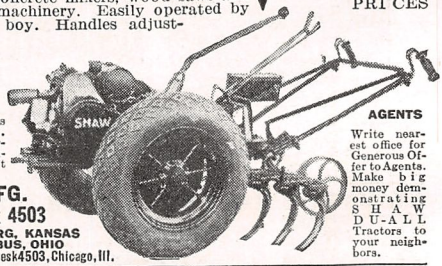

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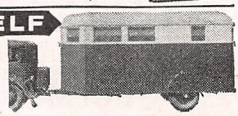

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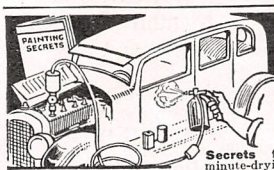

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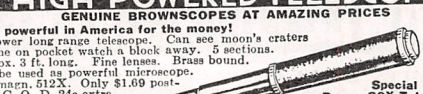

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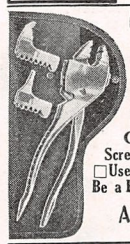

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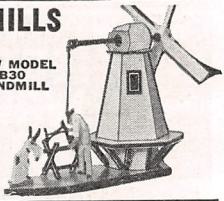
NEW MODEL B30 WINDMILL



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a little instrument, fits in the mouth out of sight, used with above for Bird Calls etc. Anyone can use it. **Never fails. A 64-page Book on Ventriloquism and the Ventrilo. All for 10c Postpaid.**

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Works same as above. Attached to motor of car. When driver presses foot on starter the contact sets off the Skunk Bomb. A dense cloud of smoke envelops front of car; upon raising hood a violent odor greets the driver. **PRICE 20c Each, 3 for 50c.** *Shipped Express only.*

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Complete with Crystal 35c

This Detector is practically a radio in itself, as it is possible to get reception with it alone, provided you are within 25 miles of a broadcasting station (or up to 100 miles under very favorable conditions). All you need is an aerial and an ear phone and you are all set. It is completely assembled and wired, all ready for use. It has two posts, making connection much easier, also making it possible to make changes quickly. Everything complete, including the stand, crystal cup, arm with catswhisker and necessary screws, an ultra sensitive crystal of the finest grade, two terminals for wire connections mounted on handsome base—**EVERYTHING COMPLETE FOR ONLY 35 CENTS POSTPAID.** Every set tested and reception positively guaranteed.

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Price for Complete Outfit, only 25 cents postpaid.

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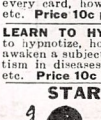

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25c Postpaid.

Here it is, boys. You can have an immense amount of fun with this new pistol. It shoots 12 to 15 ordinary peas without reloading. All you need do is to load the gun with peas, pull the trigger and keep on firing until the barrel is empty. Then reload and fire again. It is absolutely harmless and safe. Nothing to explode. These pistols sell like hot cakes, so get yours AT ONCE. Be the first boy in your town to own one of these automatic repeating pistols and be the envy of all the other kids in the neighborhood.

PRICE ONLY 25 CENTS
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LEARN TO DANCE THE LATEST STEPS. Be popular this season. Really good dancers are always admired—always popular guests. Partners welcome them eagerly. With the aid of this book you can learn the newest, smartest steps without a teacher and become a dancer who is sought after. After following the instructions in this new book you won't need to make excuses when the dance music starts. Besides you'll get lots more fun out of parties and dances. If you want to become a perfect dancer, learn to dance at home this new, easy way.

WHAT THE BOOK TELLS: How to develop poise and control, how to improve your dance steps, the art of holding, how to walk to music, how to lead, how to do the latest Fox Trot Steps, Natural and Reverse Turns, the Reverse Wave and Change of Direction Steps, the Quickstep, swaying to music, how to Waltz, Backward Changes, how to do the Continental, the famous Kiss dance, the Manhattan Dance, the College Rhumba, the Carlo, etc., etc. Numerous illustrations are given, in fact everything is made so plain and simple that if you follow the instructions given, you'll be dancing before you know it.

PRICE 25 CENTS POSTPAID.

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25c 50c $1.00

Three new models now out. **25c, 50c and $1.00.** Well made and effective. Modelled on pattern of latest type of Revolver. Appearance alone enough to scare a burglar. Takes 22 Cal. Blank Cartridges obtainable everywhere. Great protection against burglars, tramps dogs. Have it lying around without the danger attached to other revolvers. Fine for 4th of July, New Year's, for stage work, starting pistol, etc.

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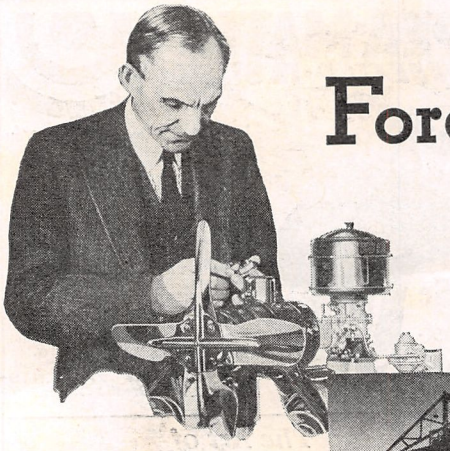
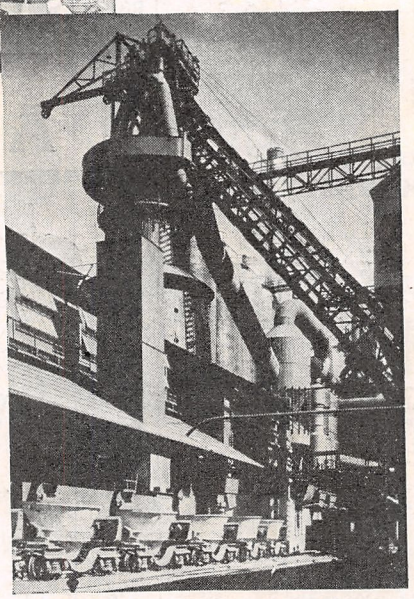
Ford Materials and Methods



Mr. Henry Ford inspects a part of the history-making Ford V-8 engine. He insists on the finest materials and workmanship.



The quality of much of the steel used in Ford cars and trucks is controlled at its source—in the Ford steel mills.

THE most important material used in automobiles is steel; more steel is used than anything else. Ford uses thirty-six different kinds. Most people haven't any idea that there are so many steels, each with a different analysis. Some are low in carbon content, others high. Many contain elements — nickel, tungsten, chromium, molybdenum, vanadium—used to secure high physical properties.

The quality of much of the steel used in Ford cars and trucks is controlled at its source —in the Ford steel mills. Grades of steel are selected to provide high physical properties in all Ford parts. That's why they have high quality.

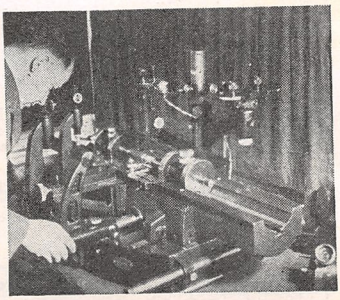
Skill in manufacture is important, not only in development and selection of material but in the production of parts. Ford uses many new and unusual methods of casting, machining and inspecting. Some were thought to be too scientific, too expensive to be used for producing automobile parts — until they were put into use in the Ford factory.

Precision has much to do with the quality of parts. The precision limits set for Ford parts established new high standards. Modern science is used in the manufacture and inspection of Ford parts. Inspection machines that have photo-electric cells, or electric eyes, and audio amplifiers like those for radio, are used to check precision. Automatic machines, for example, can inspect 1500 piston pins an hour. And if they vary in dimensions more than one ten-thousandth of an inch they are automatically rejected. The high capacity of these machines makes it possible to inspect every single piston pin, rather than a percentage of the production. Such methods further insure the high quality of Ford parts.

Experience and equipment in manufacturing is vitally important. Without it there would be no certainty of high quality. That is another reason why Genuine Ford Parts are so dependable in quality—the best parts you can buy for Ford cars and trucks.

Make sure that you get Genuine Ford Parts. Buy them from a Ford dealer or from garages that display the Genuine Ford Parts Sign.

GENUINE Ford PARTS



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The Model 5 includes every essential feature found in standard typewriters. It has standard 4-row keyboard, Complete visibility. Standard width carriage for long envelopes. Carriage return lever of exceptional design for easy and rapid operation. Margin release on the keyboard. Automatic ribbon reverse Backspacer. Two color ribbon shift. Variable line spacer. Adjustable margin stops. Auto set Paragraph Key (one of the most useful features found on any typewriter). Weight 11 lbs. 13 oz. Furnished with Pica or Elite type.

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